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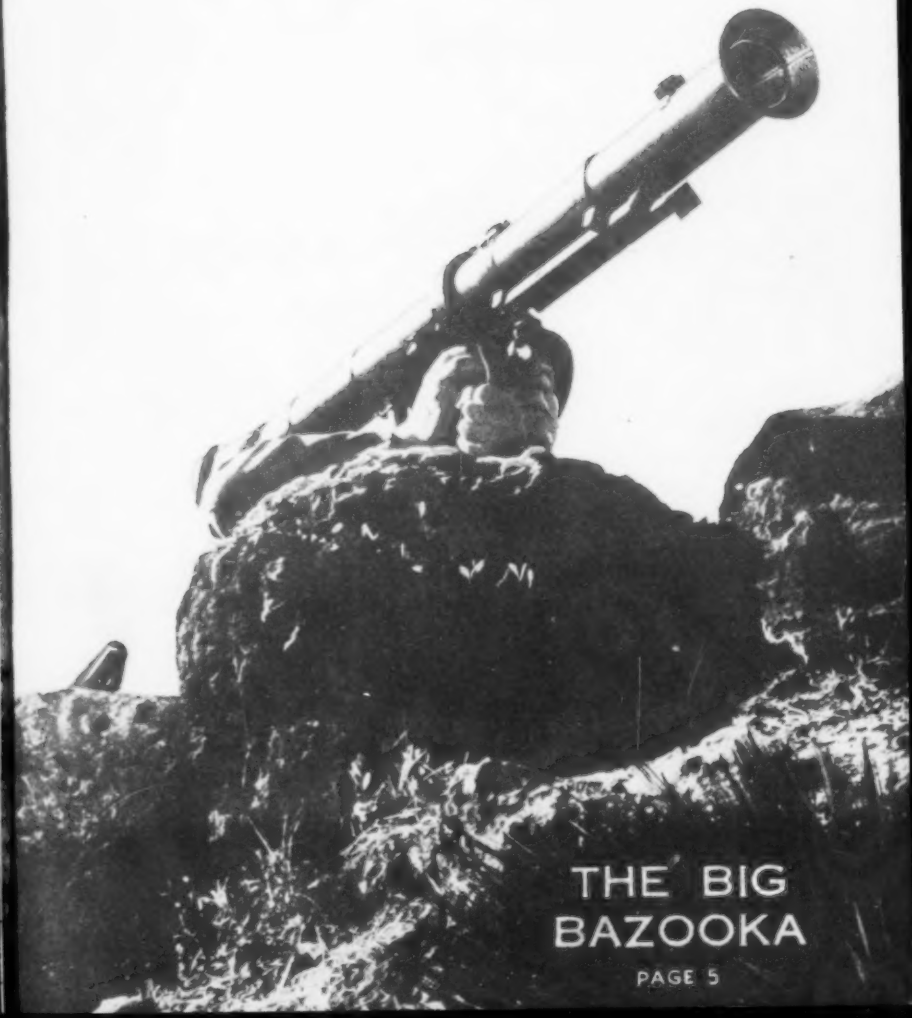

THE BIG BAZOOKA

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INFANTRY SCHOOL QUARTERLY

v. 38-41

The latest thought on infantry
by Infantrymen

THE INFANTRY SCHOOL, FORT BENNING, GEORGIA

THE INFANTRY SCHOOL

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Editor

Maj John W. Baumgartner

Editorial Assistant

Lt Ansley H. Shuler

Art and Layout

SFC William R. Wright

Printing Officer

Maj Schiller F. Shore

Circulation Manager

Maj Andrew W. Petrosky

Printed and bound by the personnel of the Army Field Printing Plant, Fort Benning, Georgia

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The Big Bazooka

By Capt Robert J. Parr, Infantry

A new tank-killer made its appearance and proved itself during the past few months of fighting in Korea. The 3.5-inch rocket launcher, the *big bazooka*, was a lifesaver to hard-pressed United Nations troops who used it to stave off the enemy's initial overwhelming superiority in armor.

The big bazooka, basically, is an enlarged model of the 2.36-inch rocket launcher. It is a smooth-bore, two-piece weapon. Except for size, its appearance closely resembles that of the 2.36-inch launcher.

Despite its size, the new launcher is not an unwieldy weapon to carry. It is normally transported in the carrying position, using a sling, with the two halves of the barrel fastened together in a double tube arrangement that eliminates the cumbersome length of the assembled weapon. (See Figure 1.) It is assembled in the same manner as the smaller weapon. When assembled its overall length is 60¼ inches. It weighs about 15 pounds—actually lighter than the 2.36-inch bazooka of World War II!

The front barrel has a folding bipod attachment and an adjustable monopod has been made an integral part of the shoulder stock on the rear barrel. The combination of the bipod and monopod forms a tripod that serves as a firm support to the launcher when firing from the prone position. It enables the gunner to fire in this position without placing his shoulder under the shoulder stock. When firing in other positions, the gunner folds the bipod under the front barrel out of the way.

A magneto-type firing device, located in the trigger grip, provides the current that ignites the rocket. The magneto is trigger activated. Each time the trigger is squeezed and each time it is released, a current is gener-

ated. This presents an important safety problem. *If the rocket fails to fire when the trigger is squeezed, the gunner must be sure to maintain his sight picture until after he has released the trigger for this second surge of current may cause the rocket to be fired.* If this happens when the muzzle of the launcher is lowered, the rocket could land

Figure 1. Folded, in the carrying position, the cumbersome length of the 3.5-inch rocket launcher is eliminated.

short, just in front of the crew, with the possibility of injury to the gunner and loader.

The electric firing circuit is the same as that on the 2.36-inch launcher and rocket: from the magneto the current passes through an insulated wire in the conduit (running along the side of the rear barrel) back to the contact spring mounting clamp and then into the contact springs.

Here the current is picked up from one of the contact springs by the long contact wire of the rocket and carried into the electric igniter inside the rocket motor. The electricity passes out of the igniter through the short contact wire to the contact band of the rocket. Here it is picked up by the contactor latch of the launcher and carried back through the launcher barrel to the magneto, completing the circuit.

A safety switch, located on the rear of the trigger grip of the launcher, is identical in action to that of the 2.36-inch bazooka. It is clearly marked for the two positions "Safe" and "Fire" to prevent any confusion.

Two types of ammunition are issued for the 3.5-inch launcher: an HE,AT rocket and a *practice* rocket. Each weighs approximately 8½ pounds, has a muzzle velocity of 340 feet per second, and a maximum range of 900 yards. The HE,AT round, having two pounds of high explosive, has great penetrating power.* The practice round has the same ballistic characteristics as the HE round but contains an inert substance in the head. Both rounds have identical rocket motors or propelling charges. (See Figure 2.)

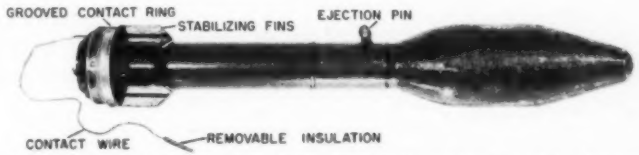


Figure 2. A 3.5-inch rocket. Note the ejection pin, a safety feature preventing premature detonation.

Although it has a maximum range of 900 yards, the 3.5-inch rocket should not be fired at a moving target over 200 yards away. This limitation is necessary to insure a first round hit. The 3.5-inch rocket with its tremendous penetrating ability will make the kill; the important thing is to HIT THE TANK! For safety reasons the minimum range at which the 3.5-inch rocket should be fired in training is 100 yards. In combat 25 yards should

*A new and more potent round is now under development.

probably be considered the minimum range, although, in the battle of Taejon in Korea, a gunner made a kill on a North Korean tank at only 15 yards. At such short ranges, firing should be done in the prone position to offer the least possible target to the fragments that fly about upon impact of the rocket with the tank.

An important addition to the 3.5-inch rocket is an ejection pin which acts as a bore-riding safety pin. (See Figure 2.) It passes through the fuze body and prevents movement of the internal parts, making it impossible for any accidental detonation during shipping, handling, or loading, even if the round is dropped.

The individual 3.5-inch rocket is issued in a hermetically-sealed metal container, which is opened with a key in the same manner as a can of sardines. The loader, in preparing the round for firing, first pulls off the shorting clip attached to each rocket. This clip is affixed to the contact ring on the fin assembly. Its sole purpose is to short-circuit any static electric charge that might cause premature firing of the rocket. This clip MUST be removed before the round is fired. Next, the long blue contact wire is pulled out from the rear end of the rocket until it is fully extended. This wire has a blue insulation down to the last few inches where it is covered by a removable blue plastic insulation which is left on if the round is to be protected against weather. When ready for immediate use, the blue plastic insulation at the end is pulled off, exposing the bare wire. The loader may now remove the safety band that is snapped around the fuze. As the band is removed, the ejection pin, which is underneath it, will move outward approximately 3/8 of an inch but still remains attached to the round. If, by accident, the ejection pin should be prematurely ejected, the round should be handled carefully and destroyed. 3.5-inch rockets are destroyed by burning.

In loading, the rocket team uses the same safety precautions and procedure as for the 2.36-inch rocket. The gunner places the safety on "Safe" and commands "Load." The loader repeats the command and, having prepared the round as indicated above, presses down on the con-

tactor latch and inserts the rocket into the breech of the launcher. As the rocket is pushed forward into the launcher tube, the ejection pin will strike against the side of the tube and will be slightly depressed. This is perfectly safe since the ejection pin should be in contact with the inner surface of the launcher tube before firing. The loader pushes the rocket into the launcher until he can release the contactor latch and have it positioned firmly *in* the contact ring. Note that although there are two bands on the fin assembly of the 3.5-inch rocket, only the *grooved* contact ring can be used with the present 3.5-inch rocket launchers. Further, the contactor latch on the 3.5-inch rocket launcher has a rounded edge instead of the beveled, knife edge of the 2.36-inch launcher; therefore, there is no need to press down on the latch and rotate the round. As soon as the contactor latch has been placed in the contact ring, the loader places the bare portion of the contact wire in one of the contact springs. The launcher is now loaded. The loader taps the gunner to signal that the weapon is ready to fire.

When the rocket is fired, the force of setback frees the ejection pin within the fuze although it is still held down by the launcher tube. Once the rocket clears the launcher, the ejection pin flies free and the rocket is armed. It is then highly sensitive and subject to detonation upon even slight impact with such objects as overhanging tree branches. This fact must be taken into consideration in selection of a good firing position.

Special safety precautions are:

1. If a rocket fails to fire and examination shows the launcher not at fault, the safety band and shorting clip are replaced and the rocket set aside for destruction by qualified personnel.

2. The backblast from the launcher is a constant safety problem. Although the actual blast of flame extends for approximately 15 feet to the rear of the launcher, the danger zone is designated as a triangular area with a base and height of 25 yards, the apex of the triangle being at

the breech of the launcher. This area must be clear of personnel and inflammable material before firing is begun.

3. Firing should not be conducted in temperatures below −20°F or above +120°F, which are the specified safety limits.*

4. Rockets with damaged fins should not be fired as they are unstable in flight and erratic in range and deflection. Care should be taken in loading to prevent damage to the fins.

Figure 3. The sight in the open - using - position.

The 3.5-inch rocket launcher has a reflecting sight assembly on the left side of the launcher. It is a folding type sight that can be swung back against the rear barrel out of the way when the weapon is carried. The reflecting sight, including the indicator arm, pivots in the sight bracket

*The temperature affects the speed with which the propellant burns. Development is proceeding to broaden the temperature range over which it is safe to fire the weapon. At present, firing personnel should be given face and hand protection when the weapon is fired at temperatures below 32° F, to protect against backblast.

assembly. This pivot mounting permits the lens frame and indicator arm to swing as one piece. (See Figures 3 and 4.) The pointer of the indicator arm sweeps a range scale on the elevation plate, thus providing elevation settings for the sight. The sight resembles that found on the latest 2.36-inch rocket launchers. The major difference is the new type of reticle in the sight.

Figure 4. The sight folded back alongside the barrel of the rocket launcher.

The earliest models of the 3.5-inch launcher used the concentric ring type reticle, similar to that of the smaller bazooka and operated in exactly the same manner. (For further explanation of this type sight, see paragraph 22, FM 23-32 ROCKET LAUNCHERS, November 1949.)

An improved pattern, considered more accurate, is the elliptical sight reticle found on later launchers.* (See Figure 5.)

The reticle consists of an ellipse crossed by horizontal

*An even newer sight is now undergoing tests.

and vertical lines. The horizontal line has two marks inside and two marks outside the ellipse. The ellipse represents the proper lead on a target moving 20 mph. The inner two marks represent the lead for a target moving 10 mph; the outer two marks together with the two angular marks in each quadrant represent an ellipse which the effectiveness of the 3.5-inch launcher in the Korean

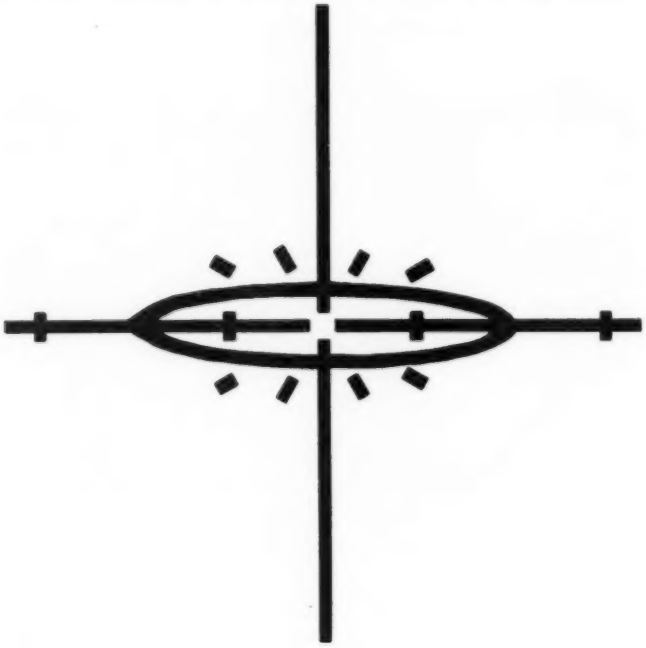


Figure 5. The elliptical reticle of the sight. It is a marked improvement over the concentric ring type reticle, permitting the gunner to judge leads more accurately for varying angles of approach.

provides the proper lead for a target moving 30 mph. These ellipses resemble a concentric ring reticle with the rings flattened to more accurately judge the leads required for varying angles of approach. Even with a target approaching or departing at an angle to his position, the gunner places that target on the ellipse representing the esti-

mated speed. He must also be sure that the center opening (which replaces the center dot of the concentric ring pattern) is leading the tank and in line with its movement.

The range scale on the elevation plate is calibrated from 0 to 9 (representing 0 to 900 yards) with notches on the plate for each 50 yards of range. These notches serve as detents to hold the range setting placed on the sight.

Sighting and aiming require two operations. First, the gunner must estimate the range to his target and set that range on the elevation plate by turning the reflecting sight assembly until the range indicator arm is on the proper range setting. Then, and only then, the gunner may put his eye to the sight and aline the target in the sight. He makes sure he has taken the correct lead on a moving target, before squeezing the trigger. The ability to make a first round hit is a major consideration in the effectiveness of an antitank weapon.

Preparedness is the first concern of the rocket launcher team. Upon being given an area to defend, the team locates the most likely tank approach and selects a position where it can best deliver effective rocket fire against tanks moving along this approach. Before preparing the position, the gunner locates a point along the approach where he can get the best shot at a possible target. This point should be one that is easily identified even when sighting through the lens of the launcher sight. The gunner estimates the range to this point and sets that range on the elevation scale. (If the situation will permit, he actually paces off the range to that and other key points.) The team then loads and the loader checks and prepares his ammunition to reload. Now, the team can prepare its position. When this work has been completed, the rocket launcher team is ready. Now it has the jump on the tank. When the enemy vehicle appears, the gunner can begin tracking. He has no worries about range or loading. He is ready for the kill. He tracks the target until the center opening of the sight reticle is sighted on the point that he has selected for the best shot. Then, he squeezes the trigger and the rocket is on its deadly way to destroy the enemy tank. No last

minute range adjustments, no final checks or corrections. Just the steady careful tracking of the tank until it moves into the point of kill and then ZOOM—and another tank threat is out of the way.

QUARTERLY service to its readers doesn't end with distribution of the magazine. Through its "Letters to the Editor" section the QUARTERLY offers its readers a place to air their views. If you'd like to pass along an idea on infantry, write to: Editor, INFANTRY SCHOOL QUARTERLY, Fort Benning, Georgia.

Balancing Cargo Aircraft—An Easier Way*

By Capt J. K. Cockrell, Infantry

*The Infantry School does not teach this method of balancing cargo aircraft. The method has been used successfully by the 82d Airborne Division and is presented here as a new approach to a time-consuming problem.

"Well, Jackson," said the S3 to his new assistant, "I'll have no trouble deciding what part of your orientation to cover today, because I expect this regiment will soon be alerted for an air transported move. Have you ever had any experience in airborne or air transported operations?"

"Not a bit, Major," Lieutenant Jackson replied. "About all I know is the difference between a C-54 and a C-82—that's the one they call the 'Flying Boxcar,' isn't it?"

"Yes, that's right,' said the S3, "and in our move we'll use some of the modernized C-82's, called C-119's, as well as C-54's. I've got a little free time right now," he added, "so I'm going to give you a brief outline of how this regiment plans an air move."

"The alert we'll get from G3 probably will tell us to plan to take everything except the Tank Company and the company utility vehicles. We'll have to determine our exact aircraft requirements and get them in to G3 within a very few hours, probably no more than three."

"That doesn't sound like much time, Major," the new assistant commented. "Just how do we go about figuring aircraft needs?"

"We consider three factors in determining what an airplane will carry," replied the S3. "First, the *space available in its* cargo compartment; second, the *weight it will carry;* and third, *balancing the plane so that it's safe to fly*—neither nose-heavy nor tail-heavy."

"The first two are easy enough to understand," Jackson answered, "but that balancing business sounds like a technical problem the Air Force ought to be responsible for."

"You're right about the responsibility," agreed the major. "Each pilot is responsible for the safe balance of his aircraft before he takes off—but we have a big problem with balance, because we have to *know* that when we plan a load for an airplane, that load will balance the plane safely."

"I think I've got the idea," Jackson broke in. "We have to load our own equipment—therefore, we've got to know where to put the cargo so that the plane will balance."

"Right! And if we don't, we'll lose a lot of loading time while the pilot figures it out. Then, too, maybe the plane *can't* be made to balance with the cargo we've planned to put in it and something will have to be left behind. Therefore, we have to plan out every load in advance, to be sure that, with each airplane carrying as much as possible, all airplanes can be balanced to fly safely."

"Before you go any further, Major, what about this space business? How do you decide what men and equipment will go in each airplane?"

"We've made a list of all large items of equipment in the regiment showing which airplanes will carry them. In planning a load, we use a floor plan of the cargo compartment and templates of the various vehicles and guns we want to load. Since they're all drawn to the same scale, we just fit the templates of the items we want to load into the area shown on the floor plan. Sometimes, though we find that while a load of vehicles will fit in the airplane and their combined weights don't exceed the plane's capacity still we can't place them so that the plane will balance. Then we have to change the load."

"Oh, yes," the lieutenant said, "I've heard officers complain about the difficulty of figuring that balance business. Sounded like a darned complicated procedure."

"They must have been talking about the method described in TM 71-210, AIR TRANSPORT OF TROOPS AND EQUIPMENT," guessed the major. "It's the one most of the army has been using. It's a good system, but it certainly

is complex. In order to use it, you have to understand clearly the principles of balance and moments of force and it involves lengthy mathematical computations. Besides, it makes actual loading difficult."

"I'll accept the first two drawbacks you mentioned at face value, sir," Jackson replied. "I never was too good at mathematics and I can just barely remember hearing about 'moments of force' in high school. But how does this TM 71-210 method make loading difficult?"

"Well, in that method we plan to load each item at precise loading points called 'stations.' But the loader can rarely identify these points accurately in an actual airplane. There are hundreds of stations in each airplane, because *each inch in the length of an airplane is a station.* Stations are numbered. The number of each one is its distance in inches from a fixed point near the nose of the plane. (See Figure 1.) The planner may locate cargo at any of these stations, yet when the loader gets into the airplane and tries to find them, he finds that only a few of these hundreds of stations are actually *marked* in the airplane. The odds are probably forty to one against his finding the ones he's looking for! I'll give you an example: In this case the center of gravity of a 2½-ton truck is to be located exactly at station 257 and the center of gravity of a 1-ton trailer at station 351. The loader is the truck driver, a private first class. When he tries to locate stations 257 and 351, he finds that no stations between 223 and 289 and between 313 and 392 are actually marked in the aircraft. As a result, he has to *estimate* the locations of the stations at which he is to place his vehicles. There are two very undesirable results of such estimation - inaccuracy, often producing unsafe flight conditions, and delays in loading."

Lieutenant Jackson nodded. "I can see why 'stations' aren't too satisfactory. And with this method so complicated, I can't see how we can plan loads for the whole regiment in three hours!"

"We can't," the S3 replied, "and it's for that very reason that the regiment has adopted a new method called the

'Index method'. This method was developed in the 82d Airborne Division after Exercise Swarmer in the summer of 1950 and is standard in that division. It's far faster. It doesn't require an understanding of balance principles or moments of force and doesn't involve difficult mathematics. That's a great time-saver right there. So we can plan with it quickly and accurately and load rapidly and safely.

"But doesn't it have some drawback," Jackson protested, "along with all those advantages?"

"Not unless you want to count a slight theoretical loss in flexibility," the S3 asserted. "But we haven't found any case yet where that loss has been noticeable. Let me

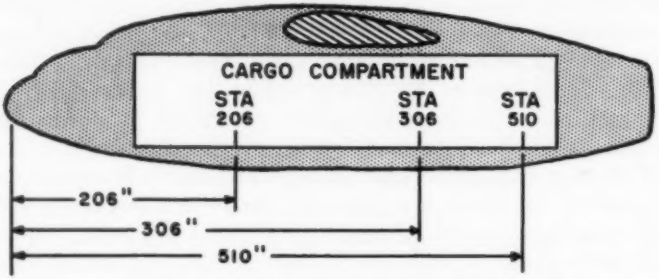


Figure 1. Cut-away drawing of a C-119 aircraft showing locations of "stations" 206, 306, and 510. Stations may or may not be indicated inside the aircraft by painted marks and numbers on the walls. They represent the distance, in inches, from a point near the nose of the plane. There is a station for every inch of distance from the front of the cargo compartment all the way to the rear.

explain the system. The Index method employs three tools: *arm numbers, rounded-off weights, and indexes.* I'll take them up in that order.

"Arm numbers are the cargo compartment loading points of the Index method. They take the place of stations. These arm numbers are numbered lines painted or chalked equal distances apart throughout the length of the cargo compartment of an aircraft, as in this diagram. (See Figure 2.) An origin line called the *zero line* is placed approximately at the balance point (center of gravity) of the aircraft when empty. Other arm numbers are then placed

forward and to the rear of this zero line: those to the rear are assigned plus numbers in ascending order toward the tail, and those forward are assigned minus numbers in ascending order toward the nose.*

Arm numbers simplify balance computations by substituting small numbers—none greater than 20—for the large station numbers used in the TM 71-210 method.

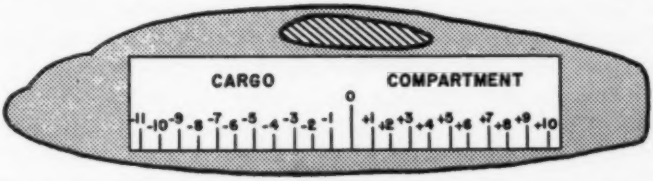


Figure 2. Cut-away drawing of a C-119 aircraft showing arm numbers marked on the sidewall of the cargo compartment. Markings also extend across the floor.

Their primary function, though, is to provide exact loading points for each item of cargo we load. In loading by the Index Method, we place the center of gravity** (CG) of each item of cargo (whether it is a jeep, stack of ammunition boxes, or a group of men) exactly at one of the arm numbers. A loader can then determine quickly and accurately where each of his items of cargo is to go, just by locating the right numbered line in the airplane."

"I don't think that's entirely clear to me yet, Major," said the lieutenant. "Could you give me an example?"

"Of course. Let's say the planner wants to load a jeep, a ¾-ton truck, and six men into an aircraft. Using templates of the equipment and the row of men, he shifts them about to see where they will fit into the cargo compartment. He finds that they'll fit by placing their CG's at the following arm numbers: the jeep at arm number +6, the ¾-ton truck at arm number −6, and the six men with

*The distance between any two adjacent arm numbers is constant for any given type aircraft. For data on zero lines and other arm numbers, see Figure 3.

**The center of gravity is the only reference point on an item of cargo that is practical for use by both planner and loader. It must, therefore, be marked on each large item of equipment before an air move.

their combined center of gravity at +10. (The center of a row of seated men is their combined center of gravity.) To position this cargo accurately, the loader need only locate in the aircraft the lines marked +6, −6, and +10 and then place the CG of his group of men or equipment over those lines. There can be no doubt as to the exact location in the plane of any item and, therefore, no delay in positioning the load. In a large air movement, this time factor becomes exceedingly important, because loading time is short and rigid departure schedules must be met.

"Now for the other big time-saving element—the rounding off of weights. That includes two steps. First, express the weights of an item of cargo in *hundreds of pounds*. Then, if it is not a whole number, *raise it to the next higher whole number*. 2300 pounds would then be expressed as 23. A weight of 10,230 pounds would be 102.3 *hundreds of pounds* and would be raised to 103, the next higher whole number; 790 pounds would be 7.9 or 8. By reducing the size of the numbers that express weights, this rounding off procedure simplifies the arithmetic of balancing. By using approximate instead of exact weights, it gives the company commander a little flexibility in vehicle loads.

"That brings us to the third 'tool' I mentioned—indexes. When you multiply the 'rounded off' weight of an item of cargo by the arm number at which that item's CG is located, your answer is the index of that item loaded at that point.

"Another type of index is the *Airplane Index* of an airplane when it is in a 'ready-for-loading' condition—that is, including gas and crew but not cargo or passengers. Airplane Indexes for every type of airplane are furnished in the Index Method Data Chart. (See Figure 3.)

"When we cancel out all of the plus indexes against all of the minus indexes for any loaded aircraft (including the index of the airplane, as well as each item of cargo in it) the resulting plus or minus figure is the *loaded index* of the plane. By checking that against maximum loaded index figures given for each airplane in the Index Method Data Chart, we determine whether the aircraft is balanced."

INDEX METHOD DATA CHART

Type ACFT	ACFT Index*	Maximum Loaded Indexes Minus	Maximum Loaded Indexes Plus	Station No.** of Zero Line	Intervals (in inches) Between Arm Numbers
C-46	− 103	− 130	+ 175	316	20
C-47	− 171	− 240	+ 305	350	10
C-54	− 298	− 305	+ 330	396	20
C-74	+ 581	− 170	+ 720	560	32
C-82	+ 86	− 175	+ 175	327	20
C-97	− 42	− 180	+ 280	527	24
C-119	− 25	− 275	+ 95	329	20
C-122	− 16	− 75	+ 135	220	15
C-123	− 103	− 145	+ 125	335	20
C-124	− 313	− 480	+ 550	572	32
C-125	− 149	− 290	+ 475	290	10
G-15	+ 84	− 30	+ 45	206	10
G-18	+ 101	− 20	+ 65	220	15
G-20	+ 303	− 20	+ 140	340	20

*These are planning figures, based on medium ranges for each aircraft; the index of an aircraft depends on its weight, which varies with its gas load and, therefore, its range. Accurate indexes for each type aircraft to be used in an actual air movement can be computed by using the following formula: (If the "ready-for-loading" station furnished by the Air Force is forward of the Zero Line the Index is minus; if it is aft of the Zero Line the Index is plus)

$$\text{AIRCRAFT INDEX} = \frac{\text{Wt of Aircraft (including crew and fuel but } \textit{not} \text{ cargo)} \times \text{Distance in inches between Zero Line and ready-for-loading station}}{100 \times \text{Interval in inches between Arm Numbers}}$$

**At least one station can be identified in the cargo compartment of each of these aircraft. Zero lines can be located by measurement from any convenient station.

Figure 3. Basic data necessary for using the Index Method. Arm number locations and intervals were selected for maximum convenience in use. Other data was computed and includes safety factors.

"Suppose the airplane isn't balanced with the load placed that way," replied Jackson. "What happens then?"

"In that case, the planner moves one or more items of the load forward or backward and tries again—it's a trial and error procedure; however, a balance almost always results from the second try."

"That doesn't sound too complicated," the new assistant ventured, "but it still seems to me that balancing the aircraft is by far the planner's biggest problem."

"You're entirely right, Jackson, and until we got this new method it was much more of a problem, because we had to do almost all air movement planning in the regimental and battalion S3 sections."

"Why was that, sir?"

"Because the TM 71-210 method is so difficult that we couldn't train enough people to have one well qualified planner in each company. Now we can decentralize detailed planning down to the company level and accomplish our planning much more quickly and efficiently. When we get an alert now, I call the separate company commanders and battalion S3's and they work out the details for their own units."

"Speaking of training, Major, how long *does* it take to teach this method?" asked Jackson.

"We can teach an officer or NCO how to plan loads by the Index Method in an hour," replied the S3, "and it takes only a few minutes to teach a man how to use the numbered lines in loading. If I describe the exact procedure we use to standardize and simplify planning, I think you'll see why. Here it is, step by step.

1. From the Index Method Data Chart, obtain the index for the type aircraft used. Then prepare the heading (see Figure 4) and enter the aircraft and its index.

2. List all items of cargo in the left-hand column. (See Figure 4, "Item" column.)

3. Express the weight of each item in hundreds of pounds and list it in the second column. (See Figure 4, "Weight" column.)

Item	Weight (Hundreds of Pounds.)	Arm No.	Indexes Minus	Indexes Plus
C-119			25	
90-mm AT gun	69	−3	207	
¼-T Tlr	10	−8	80	
¼-T Trk	28	+8		224
12 men	29	+8		232
6 men	15	−9	135	
	15100*		−447	+456
				−447
				+ 9

Figure 4. An example of a completed balance problem; the *loaded index* is +9.

*Note that two zeros have been added to the weight figure. This provides the planner with an easy reference figure to insure that the maximum weight for his load is within the figure allowed for the aircraft.

4. Place your equipment templates on a floor plan of the aircraft and list opposite each item the arm number at which its CG is to be located. (See Figure 4, "Arm Number" column.)

5. Multiply the weight of each item by its arm number to get the index of the item.

6. List the indexes in the "Plus and Minus Index" columns. (See Figure 4, "Index" columns.)

7. Add the "Plus and Minus Index" columns.

8. Subtract the smaller of these totals from the larger.* The result is the *loaded index* of the aircraft.

9. Check the loaded index against the maximum loaded index given for that type aircraft in the Data Chart. If the loaded index is less than the corresponding maximum figure in the chart, the aircraft is safe to fly. If the loaded

*This is actually an algebraic addition.

index is *greater* than the figure given, the aircraft is not safe to fly and the load must be shifted to rebalance it. When a plus loaded index exceeds the maximum allowable plus loaded index, the load must go toward the *nose*: when a minus loaded index exceeds the maximum allowable minus figure, the load must go toward the *tail*."

"That *seems* pretty clear," the lieutenant said doubtfully, "but I'd like to work one out just to be sure I understand it."

"All right, let's load a 2½-ton truck, a jeep, and five men in a C-119. I've got the cargo compartment floor diagram and the templates right here; we can see that they'll fit with the 2½'s CG at + 3, the jeep's CG at −6, and the five men in the seats along the wall next to the jeep with their CG at −6. (See Figure 5.) Then, following our standard procedure, we:

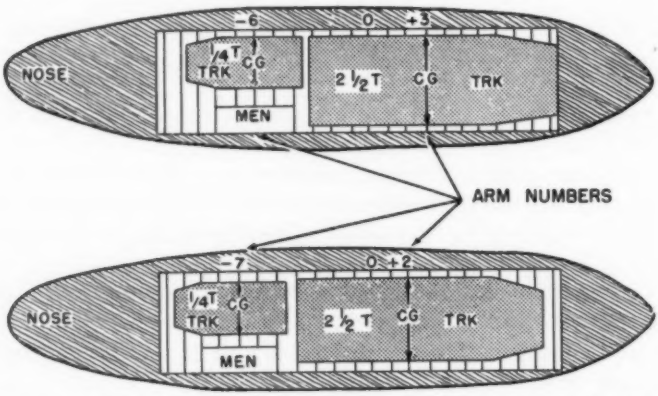


Figure 5. Floor plans of a C-119 airplane showing templates of a load consisting of a 2½-ton truck, a ¼-ton truck, and five men. In the upper drawing, the entire load is well to the rear in the airplane. In the lower drawing, the load has been shifted one arm number forward.

1. Get the C-119 aircraft index from the Data Chart (see Figure 3) and set up the form:

Item	Wt.	Arm No.	Indexes Minus	Indexes Plus

2. List each of the items of the load:

Item	Wt.	Arm No.	Indexes Minus	Indexes Plus
C-119			25	
2½-T Trk				
¼-T Trk				
5 Men				

3. Express the weights in hundreds of pounds. We'll say that this particular 2½ weighs 12,050 loaded, so we express it as *121*. The jeep weighs 2620, counting its radio, so we call it *27*, and since the 5 men are assumed to weigh 240 pounds each (the standard air movement figure) they total 1200 pounds or *21*.

4. After entering these weight figures in the 'weight' column, we enter the arm numbers in their column.

Item	Wt.	Arm No.	Indexes Minus	Indexes Plus
C-119			25	
2½-T Trk	*121*	*+3*		
¼-T Trk	*27*	*—6*		
5 Men	*12*	*—6*		

5. Multiply each weight by its arm number and put the product in the plus or minus index column. Add each of those columns:

Item	Wt.	Arm No.	Indexes Minus	Indexes Plus
C-119			25	
2½-T Trk	121	+3		*363*
¼-T Trk	27	—6	*162*	
5 Men	12	—6	*72*	
			—259	+363
				—259
			Loaded Index	+104

6. Subtract the smaller,—259, from the larger, +363; the result is +104. This is the *Loaded Index*. From the Data Chart we find that the maximum allowable plus loaded index for a C-119 is +95. Since 104 is bigger than 95 this aircraft is *not* balanced, and because it is plus we must shift the load toward the nose. After checking the

templates, we decide to shift the load forward one arm number and the recomputations work out like this:

Item	Wt.	Arm No.	Indexes Minus	Plus
C-119			25	
2½-T Trk	121	+2		*242*
¼-T Trk	27	—7	*189*	
5 Men	12	—7	*84*	
	16000*		—298	+242
			242	
		Loaded Index	—56	

7. The new loaded index, —56, is less than —275, the maximum allowable minus loaded index for a C-119. Thus the aircraft is now balanced for safe flight."

"I think I've just about got it now, sir," the lieutenant said. "I can see that it ought to be very easy to teach."

"Yes, it is," replied the S3, "but remember, the most important advantages of the Index Method are that it permits quick and accurate planning of loads and enables any soldier to position loads in an aircraft rapidly and exactly.

"To make it work you need the following:

1. Data Chart showing indexes of the aircraft to be used and their maximum plus and minus loaded indexes.
2. Weight of equipment and men.
3. Centers of gravity of equipment and men.
4. Scale drawings of cargo compartment floor plans and templates of equipment drawn to the same scale as your floor plan.

"Use these with the index method and almost anyone can plan your loads properly. And, not only that, but any of your men can load the aircraft safely."

*Note that the S3 totalled all the figures in the weight column and added two zeros to the result. This figure affords him a check against the maximum weight of cargo the Air Force will let him carry in this type aircraft, on this mission.

Tell 'Em How, Show 'Em How, Have 'Em Do It . . .

By Maj LeRoy C. Brown, Infantry

"Tell 'em how, show 'em how, have 'em do it, then discuss the good and bad points of what they've done." That's an unpolished description of The Infantry School's instructional method. Here's how it is applied to the problem of teaching "The Front-Line Rifle Platoon in the Defense."

Using an expanded lesson plan, this article guides you, the instructor, through the steps of teaching the problem; shows you an Infantry School method of demonstration without using live troops; and shows how the class experiences organizing a platoon defense position by placing squads, weapons, and sectors of fire on photomaps. It is a convenient "show 'em, have 'em do it" exercise using a minimum of instructional personnel and demonstration troops.

The lesson plan for the problem is fairly complete in itself. To further clarify it, a discussion of the "tell 'em, show 'em" techniques is added. The lesson plan appears in smaller type; discussion in regular size type.

LESSON PLAN

Title of Lesson: Front-Line Rifle Platoon in Defense
Essential Information
Day and Date: *Monday 12 April 19—* Hours: *0745-1145*
Place: *Savage Hill* Class: *1st Plat, G Co*
Instructor: *Yourself* Assistants: *3 NCO's*
Uniform & Equipment: *C*
References: *FM 7-10, para 77-83, 132-141*
Materials Required: 1. *Organizational charts of the rifle squad, weapons squad, and platoon headquarters. Each chart shows, in silhouette, personnel of the unit, weapons carried, and insignia of grade.*

2. *Pennants, stakes, and markers to stake out platoon defense area on the ground.* —(See Figure 1.)

Rehearsal: *101430 Apr 19—* Transportation: *¼-ton trk*

LESSON OBJECTIVE: *To teach organization of the area of a front-line rifle platoon in defense.*

Lesson Outline

1. Introduction—Lecture (4 min)
   a. In previous work we have studied the principles of defensive combat, terrain analysis, the antitank defense plan, and the organization of the coordinated fire plan. Now we shall study organization of the front-line rifle platoon defense area and see how the platoon fits into the defense plan.
   b. Today's problem is a basic one concerning the front-line rifle platoon in defense. Subsequent problems will deal with the support platoon, the front-line company, and the reserve company.
   c. To carry out the doctrine of defense and mission of the infantry, we must understand the principles of employing the front-line platoon.
2. Explanation—Conference—(remainder of first hour) (46 min)
   a. Platoon mission (2 min)
   b. Platoon composition (T/O&E) (1 min)
   c. Platoon firepower (3 min)
   d. Platoon frontage (4 min)
   e. Platoon rifle squads: distribution (15 min)
   f. Platoon weapons squad (10 min)
   g. Platoon headquarters (2 min)
   h. Local security (3 min)
   i. Other weapons and installations normally located in the platoon area (2 min)
   j. Preparation of platoon position (2 min)
   k. Conduct of defense (2 min)

Note that before you tell your students anything, a great deal of work has gone into preparing the lesson. Its objective has been stated, training aids have been prepared, and an area in which to present the instruction must, of course, have been selected.

To get the conference rolling, an introduction has been prepared in considerable detail. This is almost verbatim what the instructor will tell his class in its opening stages.

When you reach this explanation, this "tell 'em" stage, don't let it degenerate into a formal lecture. Ask questions which arouse interest and encourage discussion. After your

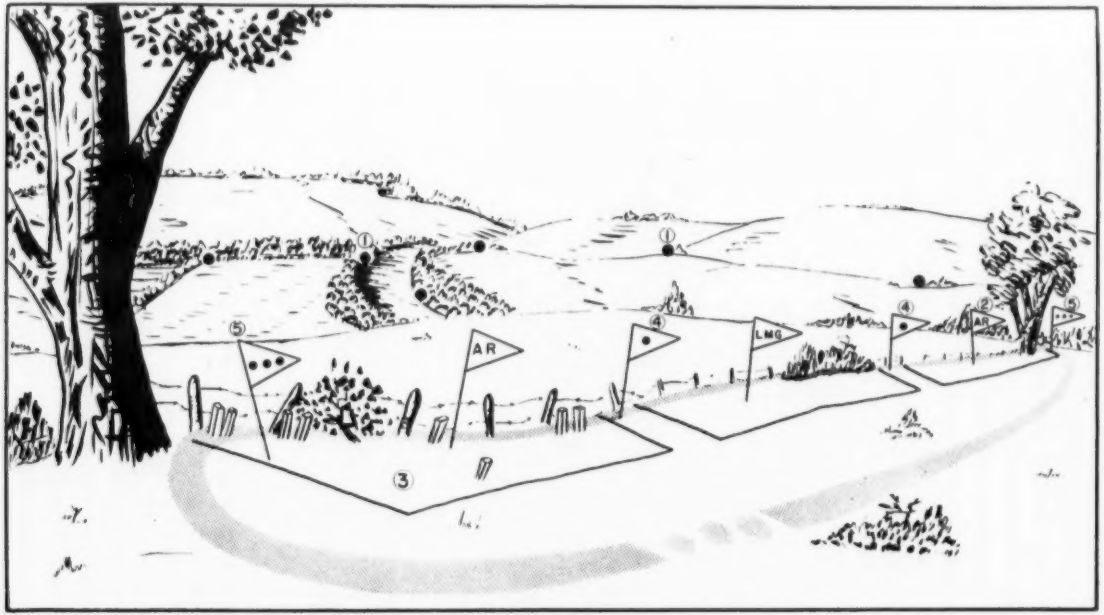


Figure 1. The following numbers refer to numbered items in the illustration.

1. Use colored discs 12 inches in diameter to indicate right and left flanks of each squad's sector of fire. Use a different color for each squad. Nail discs to trees or stakes.
2. Use lettered pennants to indicate locations of crew-served weapons.
3. Use stakes and pennants to indicate locations of all members of the left rifle squad.
4. Use pennants to indicate points on the ground where foxholes of one squad stop and those of another begin.
5. Use pennants to indicate right and left flanks of platoon's primary squad position.

brief introduction, your teaching job becomes one of controlling the discussion, maintaining a logical sequence, and summarizing at the end of the period. The lesson plan's detailed time schedule guides you through the points to be covered in the discussion. Actually this "tell 'em" phase is partially a process of having the class tell itself through answers to your questions. Let them do it. It eases your job and they'll take more interest in the problem.

The list of materials required is complete enough to permit you to carry out the instruction. However, a blackboard may be added. Use it to illustrate schematically the build-up of a platoon defensive position. Begin with a symbol of the defense area and add:

The squads and their sectors of fire

The automatic rifles and their principal directions of fire

The light machine gun with its sector of fire and final protective line

The rocket launcher and its principal direction of fire

The location of the platoon OP-CP

Use colored chalk to assist in maintaining clarity.

3. Demonstration—Tactical Walk (50 min)
   a. The class is conducted through a platoon area. White stakes, singly and in pairs, indicate the men in single and double foxholes and show the platoon organization on the ground
   b. This is a 50-minute tactical walk during which the intructor brings out the principles learned during the conference period.

The tactical walk is a "show 'em how" device. Show the students, by the use of training aids on a given piece of terrain, how that terrain is organized for defense by a front line platoon leader.

Have this area ready for the students to tour immediately after the conference. Set up stakes, pennants, and discs in advance of the scheduled class time.

If the class is large, subdivide it for the reconnaissance into groups of 40 to 50.

During the reconnaissance, stop at previously selected vantage points. (See Figure 2.) At these stops point out

on the ground the practical application of the principles discussed in the conference. Examples of points which might be discussed at various stops are:

1st Stop (near left flank of platoon position)

1. General location of the boundary between Company A (parent unit of our subject platoon) and the company on the left. (See Figure 3.)
2. General location of the right flank of the adjacent platoon on the left.

Figure 2. Stop at various vantage points when your class makes its tour of the platoon area.

3. Any fire support which the platoon receives from the platoon on the left.
4. Right and left limits of the area occupied by the platoon's left flank squad.

2d Stop (near the platoon OP-CP)

1. Location of platoon OP-CP and its coordination with other OP's in the area.
2. Observation available from the OP-CP.
   a. Of your platoon
   b. Of enemy approaches
3. Limits of area occupied by center and right squads.
4. Sectors of fire of center and right squads.
5. Points from which the enemy may observe the position.
6. Location of troops in relation to topographical and

military crests and reasons for any deviation from the normal.

7. Routes for movement from primary to supplementary squad positions.

3d Stop (near stakes representing foxholes of center squad)

1. Limits of area occupied by center squad.
2. Sector of fire of center squad.

Figure 3. Show the class the boundary on the left. (Arrow points to left limiting point marker.)

3. Any weapons other than squad weapons employed in squad area.
4. Fields of fire available and amount of clearing necessary.
5. Method of resupplying and feeding squad.
6. Location of protective wire.

4th Stop (near area of right squad) (See Figure 4.)

1. Limits of area of right squad.
2. Sector of fire of right squad.

3. Types and missions of inorganic crew-served weapons employed in squad's area.

4. General location of adjacent platoon on the right.

5. Fire support to be expected from the platoon on the right.

6. Method of coordinating location of riflemen and weapons of the platoon with locations of inorganic weapons employed within the platoon area. A skit, such as the one which follows, is an excellent method of teaching this coordination.

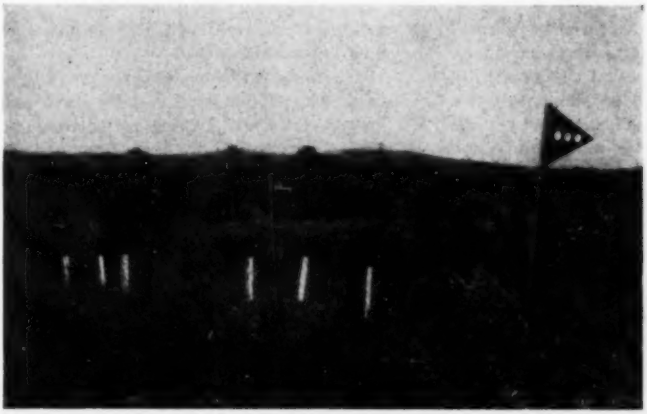


Figure 4. Right limit of right squad. Pennants represent 75-mm recoilless rifle and right limit of platoon, respectively. Stakes indicate manned foxholes.

SKIT

An assistant instructor, dressed as a sergeant, walks out in front of the class when the instructor finishes with Point 5, above. The principal instructor takes the part of the rifle platoon leader. The sergeant squats down as though looking for a gun position.

PLAT LDR: Who are you, Sergeant?

SGT: Section sergeant, Company D Machine Gun Platoon, sir.

PLAT LDR: What are you doing up here?

SGT: My platoon sergeant told me that my section is to be employed in Company A's area. One pair of guns is to be located in the left portion of Company A's right platoon area, firing an FPL to the left. (*Pointing*) That way we will have an interlocking band of grazing fire covering the gap between the two platoons.

PLAT LDR: Have you decided where you want to put your guns?
SGT: Yes, sir! (*Pointing*) I'm going to put them in back up there where I'll get good long fields of fire.
PLAT LDR: I see where we'll be doing some joint planning here, Sergeant, so the location of my riflemen will tie in with your machine gun firing positions.
SGT: Yes, sir. Now if you put your riflemen back up there (*Points*) to the flanks of my machine gun positions, that would give me good close-in rifle protection for my guns and it looks to me like good firing positions for your riflemen.
PLAT LDR: No, that won't do. I want to place my right squad generally along here. (*Points to an area about fifty yards removed from location indicated by the sergeant.*) I can get better fields of fire from there for all members of the squad. Also, notice that it places them farther down the slope where those trees will give us some concealment from enemy long range observation.
SGT: I see your point, sir, but if I move my machine guns down there, I'll be shortening my grazing fire by fifty yards and I'll have more dead space where my FPL jumps that draw leading up between this platoon and the one on the right.
PLAT LDR: Well-l-l, you're right on that point. Hmm. (*Scratching chin, thoughtfully.*) How would this work? . . . I can have my right squad dig in back this way about 25 yards farther up the slope than I'd originally intended. Then we'll still have good fields of fire and a reasonable amount of concealment from enemy long range observation since most of the foxholes will still be masked by those tall trees. I believe most of the objectionable features of the first position would disappear if you put your machine guns in the perimeter of this new position.
SGT: (*Considers this suggestion for a moment.*) I believe you're right, Lieutenant. I think that's the best we can do. I'll have my squad leader get together with the squad leader of your right rifle squad. They can make any necessary minor adjusments on the ground to get the best locations.
PLAT LDR: OK, Sergeant. Will I see you over here again later?
SGT: Yes, sir. I'm going over to check on the other squad of this section, but I expect to be back over here by the time you start digging in.
PLAT LDR: Good. We can make a final check when you come back. See you later, Sergeant.

NOTE: This skit takes into account terrain peculiar to the problem area used at Fort Benning. Your terrain, in all probability, will be different. Hence, the dialogue you use should be written to cover problems of coordination occasioned by the particular piece of terrain used for your problem area.

3. Application (50 min)

a. Photomaps are issued to the students. These maps show the general area of the problem. On the maps appear the positions of the platoon that has been studied up to this point. In addition, boundaries of the company of which this platoon is a part are shown. Organization of the second front-line platoon is not shown.

b. Tell the students they may reconnoiter, on the ground, the area of this second platoon and require them to place on the photomap the following:

(1) Primary and supplementary positions of the squads of this second platoon.

(2) Primary position of each automatic rifle, indicating principal directions of fire.

(3) The light machine gun of the platoon, showing the gun's sector of fire and final protective line.

(4) The 2.36-inch rocket launcher and its principal direction of fire.

Here we "have 'em do it"—practice organizing a platoon defense position using the principles brought out during the preceding two periods of instruction. As the instructor, you should:

1. Carefully outline the platoon area of responsibility so that students solving the requirements will understand it clearly.

2. Indicate with colored pennants the general locations of any inorganic weapon (57's, 75's, 60-mm mortars, tanks, or machine guns of the heavy weapons company) to be employed in the platoon area. Emphasize that these flag locations are flexible and shifts may be made if the student wishes to use an area of one or more of the flag locations for some of his own installations. This prevents the student from assuming that his platoon area is conveniently outlined for him by the flag locations.

3. Clearly define the areas to be occupied by platoons on either flank and indicate the amount of fire they can deliver to assist the problem platoon.

4. Circulate with your assistants throughout the entire practical work area to further orient any individuals who require it.

4. Examination

This is continuous throughout the problem. Conduct it by oral questioning and by requiring certain members of the class to give their solutions to the practical work.

By observing the solutions presented and the comments made by other members of the class you can determine how well your teaching points have been made.

5. Discussion and Critique (45 min)

a. Call on several members of the class to give their solutions to the practical work. Other class members discuss these solutions. Following the discussion, present an approved solution to the class.

b. Summary: We have studied the principles used and the detailed organization of a front-line rifle platoon defense area. We need to understand this organization to see how such principles of defense as organization of key terrain and mutual support are actually applied on the ground. We also need to know this organization in order to stop an enemy attack against our position. (5 min)

This is our "discuss the good and bad points of performance" stage of the instruction. If any one phase of instruction in this problem is important, this is it. Don't consider the discussion a necessary evil. Don't use it as a means of putting in time while you're waiting for the scheduled hour to dismiss the class. Regard it as a means of determining the effectiveness of your instruction; a time when principles can be reemphasized, obscure points cleared up. Let the students understand that it is a time for them to clear up anything that puzzles them.

Select an area for this discussion that overlooks all or a major portion of the practical work area. This allows students to point out pertinent terrain features when discussing solutions. It helps you do the same thing.

Have students who present solutions conduct the discussion and defend their solutions, while you merely guide it to prevent its going off on tangents.

After selected students discuss solutions to the complete requirement, summarize by:

1. Pointing out any good or bad points that have been overlooked by members of the class.

2. Presenting an approved solution with emphasis on application of principles.

3. Asking for questions and explaining any portion of the approved solution that requires clarification.

There you have a method of teaching by telling, showing, and having your class practice what you teach. It's an economical teaching method—this way of showing the platoon organization on the ground using pennants, discs, and stakes. It uses no demonstration troops. The only personnel you need, besides yourself, are whatever assistant instructors are necessary to help you with your charts and with orientation of the class during practical work. Their number is determined mainly by the size of your class. With a class of 40 to 50, perhaps one man, in addition to yourself, will be sufficient.

Try adapting this lesson plan to the terrain in your own training area. It's a good way to teach noncommissioned and officer classes the principles of the front-line platoon in defense.

"Letters to the Editor"—your column in the QUARTERLY—invites new ideas, questions, and comments on infantry. Address your letters to: Editor, INFANTRY SCHOOL QUARTERLY, Fort Benning, Georgia.

Raiding Patrol

By Capt Charles K. Blum, Infantry

Sergeant Mons shifted his position to get a better look out of a gaping hole torn by a shell in the north wall of the house.

"Don't get up too close to that opening, Helm," he warned his companion. "The Aggressors over there in the village of La Place are watching this hill closely."

The other man in the battered second-story room, a corporal, merely grunted as he shifted his position also.

"Looks peaceful right now, doesn't it?" mused Mons. "Deep snow lying over everything — darkness beginning to hide the ravine out there — nobody moving around. Everything peaceful and quiet. Just like a picture on a postcard."

"It don't look peaceful to me," said Helm grimly.

Mons faced his friend and grinned.

"You're remembering those birds over there in the hotel who almost cut off your head the other night with some machine gun fire."

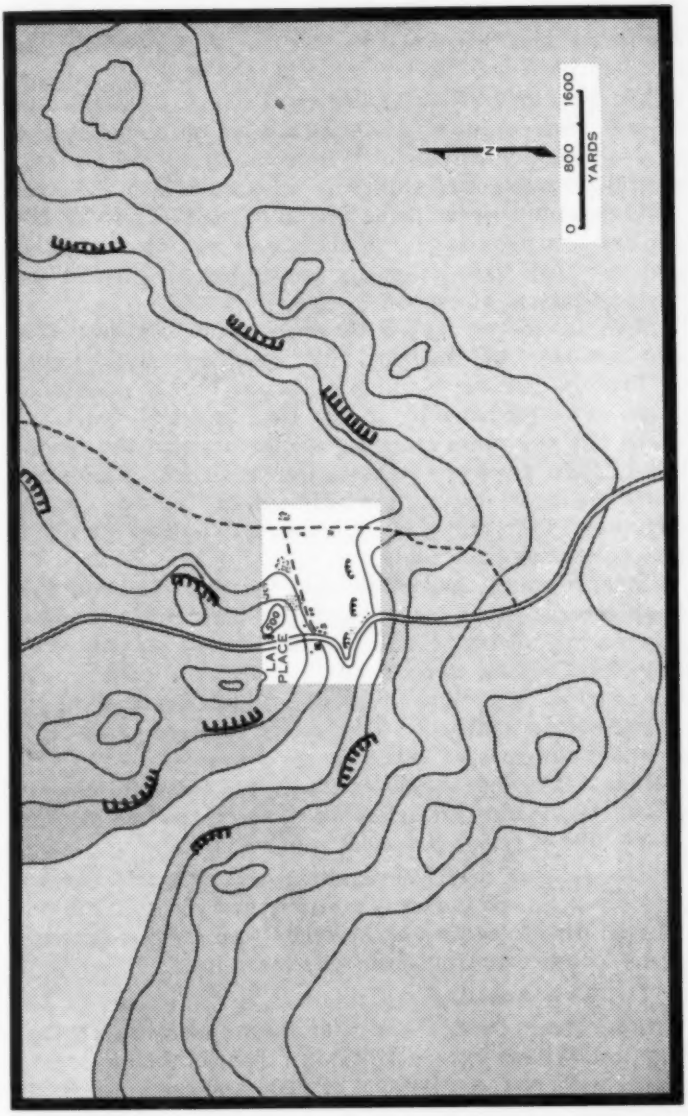
"I am," agreed Helm. "I'm also remembering the job we've got to do over there tonight."

"So am I," nodded Mons. "So am I. . . But the whole thing is planned now and already started. All we have to do is see that it gets done the way we've planned it."

"The men looked good in the rehearsal yesterday back in the rear area," Helm observed.

"Yes, they did." Mons carefully knocked his knuckles against a broken bit of wood which had once been part of a window sill. "A successful raid means three days in rest camp for all of us. That's what the Old Man at battalion said — and that's worth working for."

He looked down at a map in his hand (see Figure 1), con-



Map 1.

centrated a moment longer on an Operations Sketch (see Figure 2), and then lifted his head to stare out from his position in House A toward Hill 500 and the village named La Place. "Well, by 0200 we'll know. . . If the Aggressor keeps to his schedule, he'll move an outpost down to those buildings at *C* and *D* in about 30 minutes — just after it's dark while he's still sure nobody else is on the hill."

He spoke to his companion now in a tone that showed the two had been over this subject before — and often, so often that now they were intimately acquainted with it and entirely in agreement over it.

"They're mighty foolish to leave themselves open like that to attack from the rear of Hill 500," commented Helm.

"Right — but war is full of mistakes. They'll move some people down permanently on 500 after tonight, I bet."

The two men were referring to the fact that the enemy had neglected to occupy Hill 500. During the day, Aggressor pulled his men back into the buildings in La Place, apparently to let them thaw out the bitter chill induced by night time occupation of outposts.

Friendly patrols had established the fact that Hill 500 was occupied neither during the day nor at night. Aggressor outposts in Buildings *C* and *D* were thus left vulnerable to their rear. Failure to occupy Hill 500 was a mistake and Mons and his men were prepared to take advantage of it.

The two men watched as dusk slowly deepened and spread over the snow-covered hillsides.

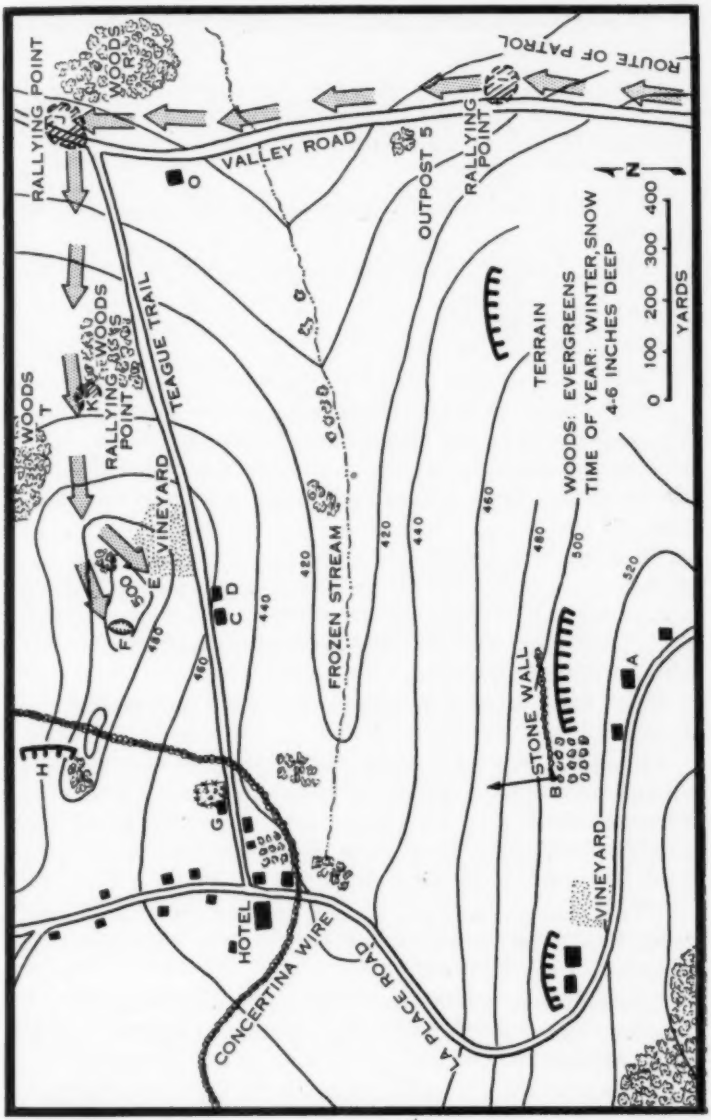
Mons knew the answer already, but nevertheless he asked: "Everybody still sleeping down in the basement?"

"Yes. But it's not a basement — it's a cave."

"Basement or cave," shrugged Mons, "it's still darned good cover . . . Well, rest is good for everybody. We'll get them all out of the sack at 2100 and feed them something warm. You still got that little gasoline stove?"

"Yes, it's downstairs."

"Good. Warm food's the best thing for a man who's going on patrol. We can have a light down there in the basement, too, so we'll inspect everyone at 2200 and push off right after that."


ROUTE OF PATROL
RALLYING POINT
VALLEY ROAD
OUTPOST 5
RALLYING POINT
RALLYING POINT
WOODS
RALLYING POINT
TEAGUE TRAIL
VINEYARD
FROZEN STREAM
TERRAIN
WOODS: EVERGREENS
TIME OF YEAR: WINTER, SNOW
4.6 INCHES DEEP
N
0 100 200 300 400
YARDS
STONE WALL
VINEYARD
HOTEL
CONCERTINA WIRE
LA PLACE ROAD
A
B
C
D
E
F
G
H
420
440
460
480
500
520

Map 2.

"Everybody's stuff was in good shape this afternoon," Helm reminded him.

"Yes, it was. But these guys sometimes forget about things — like too much oil on their weapons in this cold weather. Be sure to check that."

"Roger."

"And those demolition charges — we don't want to forget them."

"Check. You think blowing up those houses will delay us?"

"No," answered Mons.

Helm looked unconvinced.

"Seems a little like wasted effort to me," he said.

"Not when you consider the reasons for blowing them up — as someone did at battalion," reminded Mons. "The Old Man thinks that the houses were used as daylight OP's the other day when Aggressor knocked out Fox Company's mortars.

"Besides," he continued, rubbing his chilled hands together to restore warmth to them, "Aggressor is almost sure to try to move men into permanent positions down there on Hill 500 after tonight. The less shelter and protection his men find there the better."

They both fell silent. Mons continued massaging his hands.

"Eleven of us," he continued reflectively at last, his eyes on the other side of the draw. "Eleven of us and a mortar forward observer — to take three or four Aggressors out of those two houses over there and destroy an enemy outpost. Those are good odds — for us."

"We shouldn't have any trouble getting there, anyhow," remarked Helm, studying the sketch over the sergeant's shoulder. (See Figure 2.)

"Because our route has plenty of prominent terrain features on which to guide and sticks to the open, away from obstacles?"

"Right."

"Well, that's the way to pick a night route — as we both

know. Remember how we got lost one night last month in those dense woods on the other side of the mountain?"

"Yes, I remember," said Helm. "How about the return route? Are we still going to follow the same general line?"

"Yes. Our return route will be maybe 40-50 yards to the side of the route we use going out. No sense trying an entirely new route and maybe bumping into an Aggressor outpost we haven't learned about."

Helm nodded his head.

"A bit of change in the route — that 50 yards you mentioned — ought to keep us clear of ambush," he agreed.

"Are you set, Helm, on your part after we get to Hill 500?" asked Mons next.

"Yes. I'll follow in rear of the formation until we're on the hill. Then I take the two automatic rifle teams — ours and the 3d Squad's — to that little hollow you've marked *F* on Hill 500. The forward observer goes with me, too."

"Right," replied Mons. "While you set up the AR's, I'll take the other five men down to the corner of the vineyard at *E* and line them up for the assault on Buildings *C* and *D*. Then I'll come over and give you the word when to open up."

"Check. One AR guards our right flank and rear — especially toward those enemy positions near *H*—while the other AR slams two magazines apiece as fast as possible at the second-story windows of those two buildings we're raiding and then turns to fire at this building here." Corporal Helm reached over to drop a finger on the map at Building *G*.

"The FO at the same time calls for his boys to let go the concentration against these positions of *G* and *H*. I keep the AR firing until I hear the satchel charges go off in your buildings. That's my cue to pull out. Here," he said, "I've got your sketch of our withdrawal plan."

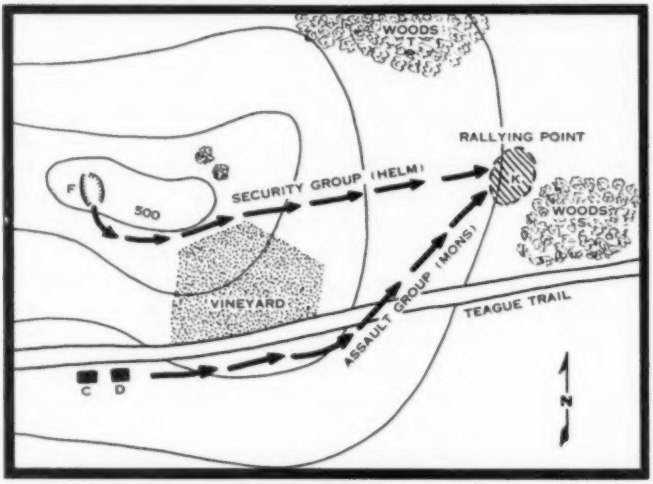
He pulled a crumpled piece of paper from a pocket and straightened it out on the floor. (See Figure 3.)

"I'll follow this route back." His finger described a path across the sketch. "The rallying point for us all to get together again is here." His finger came to a stop at the point marked *K*.

Mons nodded agreement. "Right," he said.

He then laid his own finger on the larger of the two sketches. (See Figure 2.)

"The firing of your AR and the mortars is also the signal for one of our own machine guns in the edge of the orchard —where I've marked the letter *B*—to open up on the building at *G*. That machine gun and the mortars will continue to fire even after your security group and my assault group pull out. We can shut off the mortars after we're back at the rallying point. . . . I hope the men all do what I told them in the order and on the rehearsals yesterday."



Map 3.

"They will," Helm grinned. "They couldn't help it. For five days now we've worked this thing out — eaten it, slept it, talked it, dreamed about it. I can't remember a time when I had anything else on my mind. . . . ."

There was only the slight sound of dry snow crunching underfoot to indicate the patrol's presence when, at 2250, Sergeant Mons signaled for a halt somewhere along Valley Road. (Point 1 on Figure 2.) As the men silently melted to the ground, Corporal Helm's white camouflaged figure appeared wraith-like at his elbow.

Mons whispered: "Outpost 5 is down the road just about 75 yards. You come with me to contact them. We'll leave Adams in charge here. This'll be our first *rallying point* — right here."

He bent over the man acting as point — Adams — whispered to him a moment, and then moved off, heading toward the little cluster of woods in which the outpost was located. Corporal Helm followed about ten yards distant.

Mons walked forward quietly, without hesitation. He thought: "No sense giving these fellows on the outpost the idea that I'm sneaking up on them. That would sure be inviting trouble."

A tingle along the hair-roots of his scalp was a familiar feeling of alertness and tension, however.

Suddenly a low, curt voice challenged from the darkness in front of him: "Halt!"

Mons froze.

"Who's there?" questioned the unknown challenger.

"Sergeant Mons, Easy Company — taking out a patrol."

"Advance, Mons, to be recognized."

Mons strode forward warily. He was on the far side of the road from the trees and almost opposite the trees when the next command came:

"Halt. . . Jolly."

Mons answered in a whisper with the password. "Roger."

"Okay Sarge — you can come over here," said the voice across the road. "We've been waiting for you."

It took four minutes to clear the outpost. After talking to the two men stationed there, Mons sent Helm back for the remainder of the patrol. He used Helm to check the men as they came up and passed the outpost, while he himself fell in behind the point, Adams. As he passed, the latter whispered that everyone had been told about the first rallying point (1).

Mons nodded his head, satisfied.

Guiding on the road, they moved through ankle-deep snow down to the stream bed and crossed it without incident. They were on disputed ground now. Everyone became doubly alert. Night shadows turned terrain features into

blurred vagueness, while drift-filled furrows or holes sometimes dropped a man knee-deep into the powdery snow.

The building at *O* loomed up to the left front, a dark blob in the night. Mons caught up with his point and signaled for a wide sweep away from the house. Adams obediently shifted direction toward Woods R.

Scarcely had he done so, however, when a clatter of loud noises — a thud and the rattle of falling boards — came from the building some 70 yards away.

Mons whirled. He saw his men already hitting the ground.

Dead silence abruptly fell on the night.

And then Mons heard a new sound that caused him to grin weakly and wipe sweat from his brow. It was the loud and urgent call of an abandoned pig.

"Wonder why he didn't raise a racket when I passed here Monday night?" the sergeant thought. He decided to lose no time, however, in getting his men started again.

As he moved from man to man, he whispered, with a bite in his words: "Get up. It's only a pig — one who wants some food and a friend."

Even in the dark, the little group of men who stood up gave an impression of shame-faced embarrassment. Or so it seemed to Mons as they began moving out again.

The pig's loud-voiced bereavement faded out behind them, finally to stop when they were past the junction of Teague Trail and Valley Road.

Mons halted the patrol once they were past this junction (*J*). He moved from man to man, whispering: "This is our next rallying point. You can recognize it by the road junction over there to our left rear."

Heads nodded silently as he whispered his message.

Helm had shown up again at his elbow as soon as the halt was made.

"Helm," Mons whispered. "This is where we turn left. We'll guide on the trail and on Woods S. That must be the woods up there now."

He pointed up the slope to where a dark mass loomed indistinctly against the snow and the haze of night.

"Check," whispered Helm.

They crossed Valley Road and began a silent ascent of the hill facing them. It was a slow movement forward. The woods gradually separated itself from the half haze and became distinct. Individual trees could be made out by the time the patrol swung to the right and, keeping the northern edge of the trees to their left, headed straight for the top of Hill 500.

Opposite the northwestern tip of Woods S, Mons halted his men once again. He designated the halt position, about 30 yards out from the corner of the woods, as the new rallying point (*K*).

As they moved out after this halt, a second woods came into view off to the right front.

"Woods T," Mons thought.

They finally came opposite this new wooded area and kept it to their right as they trudged upward through the snow. Nearing the crest of Hill 500, Mons could see two trees up ahead — standing lonely sentinel watch over the hill. He addressed them silently:

"I hope you're the only ones up there."

And when at last he stood under the trees, he saw that they were. The Aggressor commanders still had failed to move any forces out upon the hill.

Mons stopped near the two trees. Almost immediately Helm appeared at his side.

"Okay, Helm," whispered Mons. "Here's where we part. Take your two AR teams and the FO on over to the hollow with you. Keep down low — it's easy to skyline yourself here."

"Right."

"I'll take the assault group around the side of the hill — guiding on the vineyard over there. After they're lined up at *E*, I'll slip over to your position. Don't fill me full of lead when I do."

"We won't, Sarge."

"Okay, I'll give two quick taps on my carbine stock as a signal that it's me. . . You can move out now."

The two little groups separated silently.

Helm slipped his people carefully around the side of the

hill and then over the crest quickly into the low spot designated for his security group. He saw no signs to indicate that the enemy had become alert or suspicious.

He stationed one AR team with a clear field of fire down to the patrol's objective. He instructed this team for the last time: "Pepper those windows in short, fast bursts, —two magazines for each building. Then shift your fire to that building up there on the edge of the village."

He pointed to the building which had always been referred to as *George* in the rehearsals for the raid.

"Get your ammunition ready now," he ordered.

He turned to his other AR team.

"Keep your eyes peeled to our right flank and rear," he whispered.

Satisfied that this AR team was alert and busy, he finally turned to the mortar FO, the only remaining member of his party.

"Muffle the sound of that radio a bit," he cautioned. "Are your people ready to fire?"

"The rounds are hanging in the tube."

"Good."

Helm relaxed then. He was set for his part in the raid.

With time on his hands now, he wondered how Sergeant Mons had made out with the assault group.

Almost with the thought, he saw a blurred figure move into sight from the direction of the vineyard. As the figure neared, he heard two muffled taps — the agreed-on signal.

"Mons?" he whispered.

"Right," Sergeant Mons slipped noiselessly into the hollow beside him.

"Everything all right?" he asked.

"Sure," replied Helm in low tones. "We're all set — ready to go. How about you?"

"Ready, too. See anything suspicious?"

"No. Everything's as quiet as a church at midnight."

"Let's hope our luck holds," answered Mons. "Now, look, Helm. When I leave here, count out 60 seconds and then begin firing. Got that?"

"I count out 60 seconds and then open fire."

"Right. Start counting when I leave. And later, Helm, listen for those demolitions down there. Get your people out of here then."

"Okay."

"Good luck, Helm."

"Same for you, Sarge," whispered Helm softly.

Mons slipped away and moved back to his assault force. He was counting slowly to himself.

He found his men lined up, just off the corner of the vineyard—waiting to make the dash down the hill. They were in the prone position.

He had no time to talk to them. From the ditch on the hill, Helm's automatic rifle spat a sudden stream of fire down at the two houses to be captured.

The waiting men sprang up and moved swiftly downhill.

No answering fire came from the buildings to stop them. The one assault team dashed across the trail and disappeared into Building *C*.

Mons slid down the embankment with the other assault team. For an instant he was conscious of a flash of flame coming from one of the ground floor windows. Then a carbine set on automatic fire splattered fire through the window.

A hand grenade was tossed inside. With the explosion the men sprang up and over the window sill into the house.

Mons followed.

It was dark inside. Someone was shouting.

Mons found his way into a hallway. His eyes started to accustom themselves to the new darkness inside the building.

There was another flurry of shots—this time from an upper floor. And then silence.

He heard someone running down the stairs. He readied his weapon. A figure loomed up in the hallway, on the bottom step. Then Mons recognized a black armband worn over the snow camouflage suit—the identifying mark of his men.

"Keep it quiet," he growled.

"Sergeant Mons?"

"Yes," he answered.

"We've got two prisoners, sergeant—and one Aggressor who'll have to stay after we leave. His worries are all over."

"Okay, Kent. Check the house fast. Then start the prisoners on the way back. Put your demolitions man at the back door—just outside it. . . Was anyone hurt?"

"No."

"Good. Get your people moving now."

He went outdoors and cautiously approached the second building. From a window he was challenged: "Halt!"

"It's me, Adams—Mons," he answered in low tones.

"Okay, Sarge. There's nobody in this place. And we're both okay."

"Fine. Join Kent—he has two prisoners and is just now moving out. Leave your demolitions man here. We'll give you three minutes start and then we'll blow up these places."

"Roger."

In a few moments two men came out of the building, a large stone barn. One moved off and joined a little group abandoning Building *D*. The other man, with a demolitions charge, remained behind.

Mons hurriedly repeated instructions to this man: "Remember, drop it through the window into a corner of the building. Look, through this opening here. Take your time and be sure the fuze is started. I'll be back in a minute, after I check the demolitions man on the other building. I'll give you the word when to pull the igniter."

He got hold of the second demolitions man and repeated his instructions. Both men had cool heads. He knew he could depend on them.

He returned to Building *C* and began counting off the seconds to himself. At last he whispered: "Okay—*now*."

A satchel charge, with sputtering fuze, was dropped through an open window.

They retreated to the other building, where a second charge was instantly dumped through a window.

"We've got almost a full minute," Mons cautioned his companions. "But let's get some distance between us and this place!"

They sped down the south side of Teague Trail. (See Figure 3). They had not quite passed the vineyard on the opposite side of the road when the first dull boom sounded behind them. There was a rending groan and protest of wood and stone—and then a corner of the stone-walled barn bulged out tremendously. The roof lifted and then crashed with a rending, reverberating sound.

A second explosion tore open the other building.

But when it came, Mons and his two men had already swung past the vineyard and across to the north side of Teague Trail. He saw Woods S indistinctly ahead of him and headed for it.

For the first time now he became conscious of enemy fire. The crackle of spasmodic small arms came from the far side of Hill 500. Some colored tracers tore past high overhead.

"Too late," commented Mons softly. "The cat's already got away with the canary."

Then he remembered Helm's group and crossed his fingers for them.

At the rallying point they were challenged harshly. Recognized and advanced, Mons speedily checked on the men present.

All of the assault group—six men, when he counted himself—were there, as were the two prisoners. He found the prisoners huddled on the ground in the center of the rallying area.

A guard behind him challenged someone in the night: "Halt!"

Mons listened as challenger and challenged established identity. It was Helm, easily recognized by his voice.

He silently counted the men who came in with Helm—five—six with Helm. Everybody was back, then.

"Helm?" he whispered, moving to his assistant's side.

"Sergeant Mons?"

"Yes," he answered. "Everybody all right?"

"One man got nicked in the arm." Helm whispered. "But not bad. He can make it back by himself all right. I've already dressed his arm."

"Good. Let's get them on their feet and pull out of here."

He and Helm moved around the circle, whispering instructions. He then looked around to make sure everyone was on his feet.

Before he could give the signal to move out, however. Helm slipped up beside him, as so often before that night, and whispered: "How about some ham on the squad menu tomorrow, sergeant?"

Mons thought of the pig at House *O* on the route behind them. But then he regretfully pushed temptation aside.

"Not tonight, Helm," he replied. "Maybe after we get back from those three days at rest camp. . . ."

Reader opinion does much to shape the policies of the INFANTRY SCHOOL QUARTERLY. Let us know how the QUARTERLY can serve you better. Write to: Editor, INFANTRY SCHOOL QUARTERLY, Fort Benning, Georgia.

Your New 2½-Ton Truck

By Capt Robert M. Cook, Infantry

If you haven't already received it, in the very near future your unit will receive a new 2½-ton truck. It is a replacement for the World War II standby, the GMC 2½-ton truck. This new vehicle, built by the Reo Truck Company, will be known as the Truck, 2½-ton, 6x6, Cargo, M-34. (See Figures 1 and 2.)

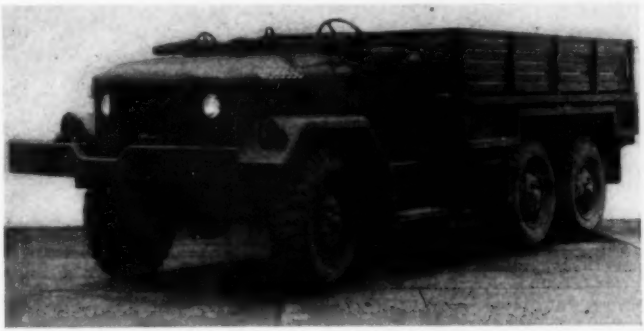


Figure 1. The 2½-ton truck, cargo, 6×6, M-34, features:
a. Synchromesh transmission and transfer case.
b. Automatically engaged and disengaged front wheel drive.
c. Hydraulic brakes with compressed air booster.
d. 24-volt electrical system.

As soon as your people see this truck, they'll ask many questions: "Why a new truck? What was wrong with the GMC? Is this truck any better?"

This article provides you with the answers.

WHY?

"Why build a new truck? . . . . . ."

When VE and VJ-Days arrived in 1945, war material

production was drastically cutback. The construction of the wartime GMC was halted and assembly lines were diverted to civilian automotive production. So, since 1945 the Army has been operating from vehicle and spare parts stocks that were on hand at the end of the war. The time was bound to come when these stocks would be so depleted that it would be uneconomical to keep the old vehicles in operation.

Figure 2. The M-34's truck bed is approximately the same size as the GMC's. The cab is demountable; cab doors have built-in adjustable windows; cab seats three.

The Army had one of two courses open to it: (1) set up *new* assembly lines and build the *old* GMC again: (2) set up *new* assembly lines and build a *new* truck similar to the GMC, but incorporating new ideas and developments in automotive engineering.

The second of these courses was selected as the more logical and Army Ordnance prepared specifications for a new truck. Bids for the construction of 5000 of these trucks were requested from the automotive industry. The low bid was $31,768,013 for 4970 trucks plus a suitable cross-section of spare parts. Thus, our new trucks are costing us just about $6,000 apiece.

When considering what appears to be a high unit cost, remember that resuming manufacture of the wartime "two-and-a-half" would still have cost about $6,000 a unit.

WHAT WAS WRONG WITH THE GMC?

Actually, there was nothing really wrong with the GMC.

It went through the war and performed ruggedly in every theater of operations. In fact, in some circles, a slighting remark about the GMC is considered almost a personal insult, for the GMC was truly the backbone of our army transportation.

However, there was room for improvements, as shown by the following discussion of radical changes in five major items.

1. *Weight/horsepower ratio:* This ratio (the gross vehicular weight divided by the brake horsepower) serves as a measure of comparison between vehicles. Vehicle performance such as acceleration, top speed, and climbing and towing ability are, to a large extent, measured by this ratio. The fewer the pounds per horsepower, the better the overall performance will be.

Here is a comparison of the GMC's and the M-34's weight/horsepower ratios:

Vehicle	Brake Horsepower at Governed Speed	Gross Vehicle Weight w/2½-ton Load	Pounds per Horsepower (weight/horsepower)
GMC	91.5	16,580 pounds	182
M-34	130	17,500 pounds	132

Since the M-34 has a lower weight/horsepower ratio, it has better all around performance. This is demonstrated by test results that prove acceleration, top speed, towing, and hill-climbing ability are appreciably superior for the M-34.

2. *Electrical system.* Electrical systems supply power measured in watts. This power is calculated from the formula:

$$P = EI$$

where

P = Power *in watts* (direct current)
E = Electromotive force *in volts*
I = Current flow *in amperes*

The normal automotive electrical system operates on six volts. This means that for a large amount of power the

amperage (or current flow) must be large since the voltage is fixed at six volts.

The same amount of power if drawn from a 24-volt system results in much less current flow because the fixed voltage is higher. This decrease in current flow results in an increase in the discharge life of the battery.

A 24-volt system is used on the M-34 and it will be used on all new vehicles. This plan has several advantages:

a. Interchangeability of all automotive electrical equipment within the infantry division.

b. More compact electrical systems.

c. Longer battery discharge life.

d. Stronger starter motor power.

e. Better and more uniform power source for infantry division vehicular radios.

3. *Brakes.* Practically all vehicular brakes today are hydraulically operated. For heavy trucks these hydraulic brakes must be helped or boosted by an additional source of pressure. The two most common pressure boosters are operated by vacuum and by compressed air.

The first of these—the vacuum boost—under the name HydroVac System—is used on the old GMC. It consists of a reservoir connected through a one-way valve to the intake manifold so that the suction of the engine creates a partial vacuum in the reservoir. This reservoir is connected to a working piston and cylinder to apply an extra force to the hydraulic system when the brake is applied.

The working pressure of the HydroVac System is limited by the fact that the engine can create a maximum vacuum of only ten pounds per square inch.

The second system—compressed air boost—is used on the M-34. It consists of a small air compressor bolted to the engine block and turned by the fan belt. The compressed air is stored in a reservoir for use against a piston to add extra force to the hydraulic brake system. The maximum pressure of this system is 110 pounds per square inch—eleven times more pressure than is exerted by the HydroVac system.

Other points in favor of the M-34's compressed air type booster are:

a. Its functioning does not depend on the engine's actually running. In a recent unofficial test performed by the Automotive Department at The Infantry School, an M-34 and a GMC were run down a steep hill with engines dead. The number of effective brake applications were counted on each truck. The M-34's brakes were applied 65 times before the compressed air reservoir was emptied; the GMC's only four times.

b. The compressed air can operate:

(1) Wind shield wipers

(2) Inflate tires (each M-34 has its own tire inflation hose that connects to the reservoir)

c. The M-34's brake system includes a warning buzzer that sounds when the air pressure drops below 90 pounds per square inch. This gives ample warning before the air pressure gets so low as to be ineffective.

4. *Waterproofing.* The GMC is basically a civilian vehicle applied to military uses. Hence, any waterproofing of the vehicle consists of using expedients to do a temporary waterproofing job. To waterproof a GMC requires 29 separate operations and almost eight man-hours of work.*

The M-34, on the other hand, is our first general purpose vehicle to be designed and built with waterproofing requirements in mind. It takes about *one man-hour* to prepare it for deep water fording. Some of the features which make this possible are:

a. Air intake and exhaust pipes so located and flanged at the ends that extension pipes can be easily attached.

b. Instead of breather vents in the differentials, transmission, and transfer case, small metal tubes lead from these units to the air cleaner and intake manifold. This permits the units to "breathe" without being contaminated by water seeping in or extra pressure building up to blow out oil seals. On the GMC, breather vents have to be waterproofed by applying an asbestos grease.

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*This does not include the time needed to perform a semi-annual Maintenance Service. Both trucks require this service before an amphibious operation.

c. The electrical system includes waterproofed generators, starters, wiring, spark plugs, distributor, and coil. On the GMC the complete electrical system must be waterproofed by painting with a special paint and applying asbestos grease. This expedient method of waterproofing creates a mess in the engine compartment that can be appreciated only by those who have to work on the engine later.

d. The crankcase has a ventilation valve. When closed, this valve traps the "blowby"* in the crankcase and pressurizes the crankcase. This prevents water from seeping in and contaminating the oil. In the GMC a pipe must be attached to the oil filler and led up to the air intake to vent the crankcase.

5. *Power Train.* In the GMC, this is a conventional system consisting of transmission, transfer case, propeller shafts, universal joints, final drives, and differentials.

The new M-34's power train, basically like that of the GMC, has many radical improvements. Both vehicles have a five-speed forward, one-speed reverse transmission and a high and low range transfer case. In the M-34's the transfer case is a synchromesh unit that can be shifted while the vehicle is in motion. The GMC's transfer case has constant mesh that requires the vehicle to be slowed or stopped before shifting.

A second good feature of the M-34's power train is the high degree of interchangeability of parts.

A much more sensational improvement is the device incorporated within the transfer case to engage and disengage the front wheel drive as needed without thought, decision, or action on the part of the driver. The manual front wheel drive engaging lever has even been eliminated. This unit functions as follows.

The front wheel drive is engaged and disengaged through an overrunning clutch.* This simple, effective

*"Blowby" is the automotive term for the burned gases which escape under high pressure from the combustion chamber past the piston rings into the crankcase.

*The overrunning clutch is perhaps more familiar to the reader as a part of free-wheeling transmissions and overdrives.

mechanism is based on the fact that the gear ratio in high range from the transfer case to the rear axle is 1.0:1.0, whereas, from the transfer case to the front axle it is 1.08:1.0. Thus, when the vehicle is traveling with sufficient traction, only the rear wheels are pulling because the front propeller shaft is actually turning at a faster rate than the input shaft to the overrunning clutch and the clutch does not engage. However, when there is loss of traction by the rear wheels the vehicular speed drops while the engine speed remains the same or even speeds up. When the speed of the input shaft to the transfer case and the speed of the propeller shaft to the front wheels are equal, the front propeller shaft engages the overrunning clutch and power is transmitted to the front wheels. When traction is gained once again by the rear wheels, the difference in gear ratios causes the overrunning clutch to disengage and the front propeller shaft again idles.

There is one drawback to this system. When the vehicle is reversed, the overrunning clutch is locked out and the vehicle is in six-wheel drive. Now the difference in gear ratios results in a "windup" or twisting of the front axle and front spring which causes poor steering and tire-scuffing when the vehicle is backed up on a hard-surfaced road. To correct this fault, the transfer case is now being modified to give a second overrunning clutch for reverse gear.

For a graphic description of the operation of the automatic front wheel drive, see Figure 3.

Here are some more features of the new truck:

1. Load capacity—10,000 pounds on the highway and 5,000 pounds cross country. This is the same as for the GMC.

2. Cargo space—147″ × 80″ × 60″, virtually the same as the GMC. A bad feature of the M-34 is that the cargo floor space is broken up by two wheel wells. Larger wheels on the M-34 make these wells necessary. This does not affect the total cargo carried but it does present a problem in stowage. (See Figures 4 and 5.)

3. Top speed—60 miles per hour with rated load on the highway.

4. Will climb a constant 3.8 per cent grade, with full load, at 30 miles per hour.

5. Has a range of 350 miles at 35 miles per hour. Tank capacity—50 gallons. Gasoline mileage—7 miles per gallon. Gasoline mileage is the same for the GMC and M-34, but the GMC puts out only two-thirds the power of the M-34.

6. Will operate in temepratures from —65° Fahrenheit to 125° Fahrenheit.

7. Will ford water up to seven feet deep.

8. High degree of interchangeability of parts results in spare parts storage space saving of about one-third.

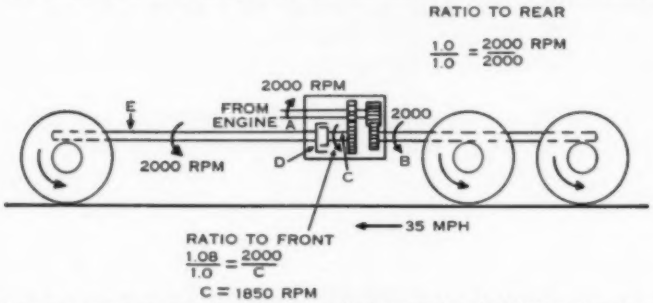

Figure 3. The gear principle that eliminates hand-shifting the front wheel drive. Assume that the truck is traveling in high gear, high range at 35 MPH. The engine is turning at 2,000 RPM. The gear ratio of input shaft "A" to output shaft "B" is 1.0:1.0, giving "B" a shaft speed of 2,000 RPM.

The ratio for shaft "C", leading to the front axle, is 1.08:1.0.

Since $\frac{1.08}{1.0} = \frac{2,000,}{C}$ C = 1850 RPM.

Shaft "C's" speed is 1850 RPM. Inside the transfer case this shaft is connected by an overrunning clutch "D" to the propeller shaft "E" leading to the front differential.

Anytime the rear wheels are turning without slipping, power is transmitted only to them. However, when the vehicle passes through an area where the rear wheels tend to slip, the vehicle slows down as traction is lost. The front wheels slow down as the vehicle slows down. When their speed falls to engine speed, the overrunning clutch engages and transmits power to the front wheels as well as the rear wheels. At 35 MPH a drop of three MPH is enough to cause the clutch to engage.

As soon as the vehicle again has good traction, the overrunning clutch disengages and shaft "C" idles.

9. Ground clearance—12 inches minimum as compared to 9 7/8 inches for the GMC. (See Figure 4.)

10. Has several air transportability features. (See Figure 4.)

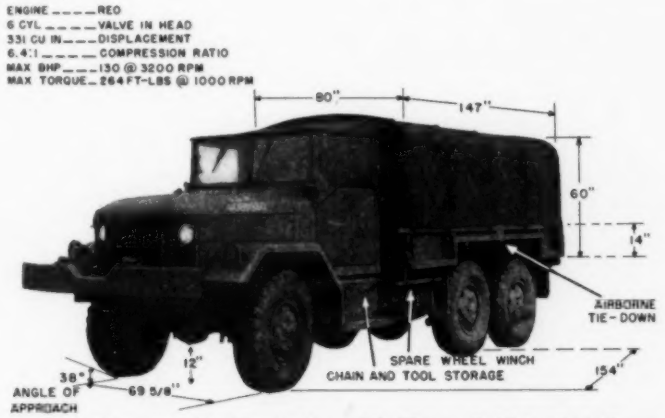

Figure 4. Compare this illustration with Figure 5. Note that dimensions of the cargo-carrying space are nearly the same in both trucks.

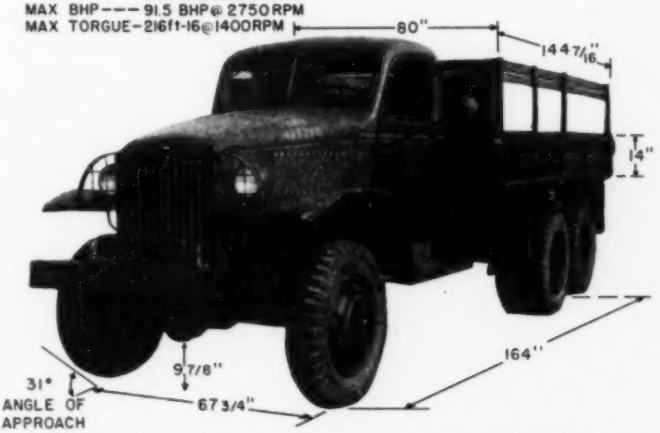

Figure 5. The Army's old 2½-ton, cargo-carrying truck.

a. An extra data plate, mounted on the dash board, gives all vehicular dimensions, weights, and location of center of gravity for various load combinations.

b. Airborne tie-down hooks and eyes are attached at suitable points on the chassis and body.

11. A flat broad step extends across the width of the vehicle when the tail gate is down.

12. Has a 50 per cent power increase over the GMC. Brake horsepower with accessories:

GMC—91.5 horsepower at 2750 revolutions per minute

M-34—130.0 horsepower at 3400 revolutions per minute

Maximum torque:

GMC—216 foot-pounds at 1400 revolutions per minute

M-34—270 foot-pounds at 1400 revolutions per minute

13. There is a built-in fuel primer system, dash mounted. This feature is especially valuable in cold weather.

14. A slave receptacle, mounted on the cab, permits connecting an outside electrical power source for cold weather starting.

15. The radiator is joined to the engine by metal straps to form a unit (with the engine and transmission) that can be removed by two men in 25 minutes. The same job requires about six hours on the GMC. (See Figure 6.)

16. All disconnect fittings are painted yellow. This prevents time-consuming mistakes. There are 18 such fittings on the engine unit.

17. The battery unit consists of two 12-volt batteries mounted in series on a sliding tray. (See Figure 7.) This is mounted under the cab below the right seat. It is reached through a small door above the running board.

18. The air compressor, mounted on the right of the engine block, has its cooling and lubrication systems connected to the cooling and lubrication systems of the engine. This reduces necessary maintenance on the compressor.

19. The vehicle has the new 11:00 $\times$ 20 cross-country tire. This gives greater flotation than the orginal GMC 7.50 $\times$ 20 or the modified GMC 10.50 $\times$ 18.

20. The complete brake assemblies are interchangeable for all wheels. The component parts, such as wheel cylinder, backing plates, and drums are interchangeable.

21. The front wheel bearings are interchangeable with the rear bogie trunnion bearings.

Both left and right front axle constant velocity joints are interchangeable.

23. The components of the differentials (of both front and rear axles) are completely interchangeable.

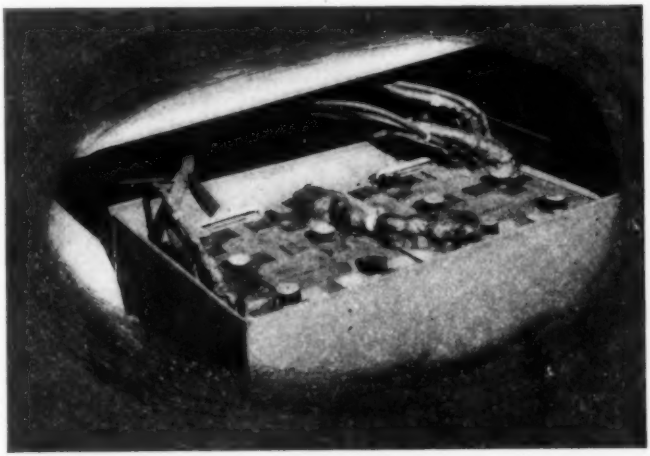

Figure 7. The M-34's battery unit consists of two 12-volt batteries connected in series to provide a 24-volt power source for the electrical system. Note waterproofing on cables and terminals.

24. The pillow block, as used in the GMC, is eliminated by the new type differential.

25. Steering is by a Ross twin cam and lever steering gear very similar to that on the ¼-ton truck. (This is a simple, good, steering gear, but it is generally considered inferior to the recirculating ball and nut type found on the GMC.)

26. The cab seats three people comfortably, has a demountable canvas top, and comes with doors that have adjustable windows. The seat is adjustable.

27. The cargo space will carry the same number of men, seated as the GMC.

28. The spare tire mount has a simple built-in winch that allows one man to safely mount and dismount the tire on the tire rack. (See Figure 4.)

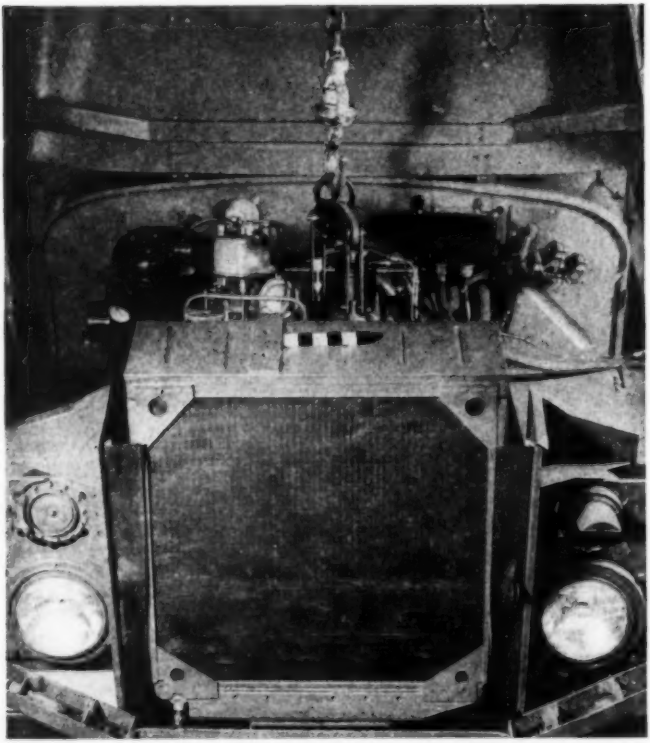

Figure 6. The M-34's engine, radiator, and transmission can be removed as a unit in 25 minutes. Removal requires disconnection of only 18 fittings.

MAINTENANCE

Although maintenance policies and procedures have not yet been fully established, it appears that overall maintenance will be less for the new truck than for the GMC. The usual monthly check may become bi-monthly. Many aspects of the six months check may not be required. This

decrease in maintenance is due to the fact that the system is sealed.

Less time will be needed to train maintenance personnel. For instance, a considerable saving in training time results from not having to train men in the use of the Low Voltage Circuit Tester.

IS THIS A BETTER TRUCK?

This question has been answered to a certain extent by the preceding facts. From a practical view, it will be answered conclusively by the man in the field who must drive it and maintain it. Those who have worked with the M-34 so far are almost unanimous in praising it.

If you have ideas for making the QUARTERLY a more useful magazine for Infantrymen, write to: Editor, INFANTRY SCHOOL QUARTERLY, Fort Benning, Georgia.

Action At Tongmyongwon

By Lt Col James W Edwards, Infantry

EDITOR'S NOTE: While the following article contains several examples of the successful application of tactics and techniques taught at The Infantry School, it is published primarily as an interesting account of a combat action in the early days of the Korean conflict.

The action at Tongmyongwon was a typical example of an infantry battalion in defense during the early days of the war in Korea. Fighting to help contain a Red bridgehead across the Naktong River, this defense involved plugging a hole with a platoon here, a company there, a squad somewhere else. It was a mixture of retreat, defense, and limited objective attack. Its success was due to bravery of the American soldier, and the application of proven tactical principles, including full use of supporting weapons and air support.

Tongmyongwon is a small village approximately eight miles north of Taegu on the Taegu-Sangju Road. The 37th Field Artillery Battalion (less one battery) of the 2d Infantry Division and two batteries of the 8th Field Artillery Battalion of the 25th Infantry Division occupied firing positions in the narrow valley around Tongmyongwon. They supported the 1st South Korean Division and the American 27th Infantry Regiment which was in position about three miles north of Tongmyongwon. (See Figure 1.)

On 20 August 1950, the North Koreans launched a determined assault to take Taegu. The attack was a two division effort with the 13th North Korean Division driving south on the west side of the Sangju-Taegu Road and the 1st North Korean Division on the east side of the same road.

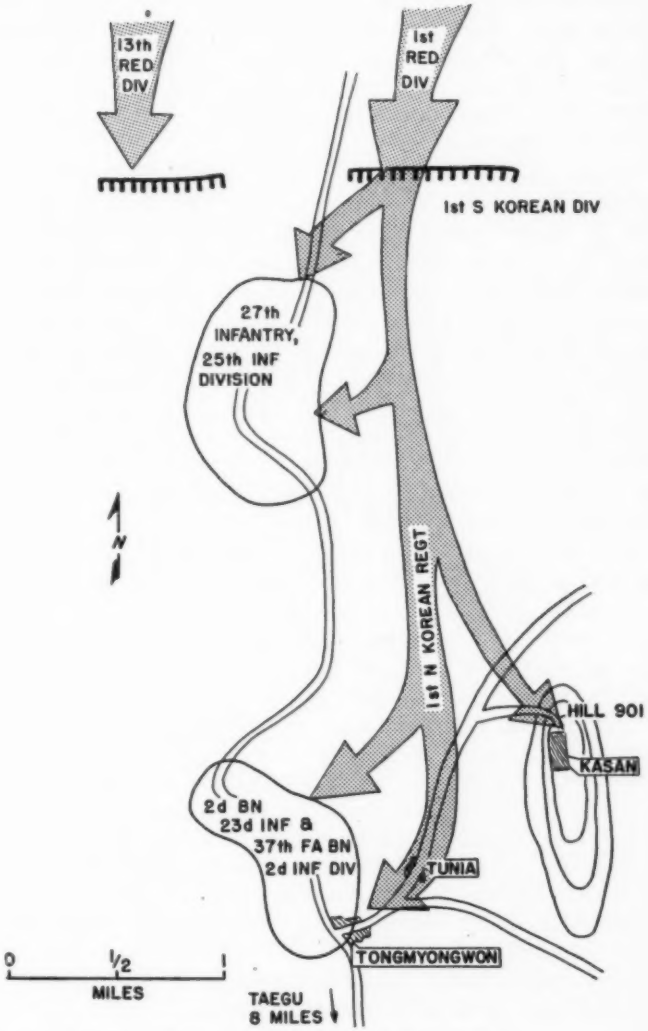

Figure 1. General situation in the vicinity of Tongmyongwon, 20 August 1950.

The attack of the 13th North Korean Division was stopped by South Korean troops, but the attack of the 1st North Korean Division punctured the thinly held line of the 1st South Korean Division and gathered momentum as it came south. Elements of this division hit the U. S. 27th Infantry and were repulsed.

Other elements of the 1st North Korean Division overran Hill 901 (actually a plateau) on which was the walled city of Kasan (see Figure 1). This high plateau was the dominant terrain feature in the area and provided observation over all the surrounding terrain as far as Taegu.

The 1st NK Regiment, spearhead of the 1st NK Division, had been told that it would be in Taegu in two hours after it had overrun the American artillery near Tongmyongwon and carried a regimental flag, later captured by the 2d Battalion, 23d Infantry Regiment, that was to be hoisted over the city hall of Taegu. The NK regiment headed for the 37th Field Artillery Battalion (see Figure 1), after breaking the South Korean line.

The 2d Battalion, 23d Infantry Regiment, moved up on 20 August 1950 on regimental order to the Tongmyongwon Valley. Its mission was to protect the artillery near Tongmyongwon. The battalion was about 75% T/O strength, but 60% of the officers and 30% of the enlisted men, mostly NCO's, were combat infantrymen. Morale was high. The battalion was disposed as shown in Figure 2, forming a defensive perimeter around most of the artillery with one platoon of Company E dispatched to protect Battery A of the 8th Field Artillery Battalion, which was to the south, outside the hills immediately adjacent to the valley. While this protected the artillery from aimed small arms fire, it did not protect it from observed enemy mortar and artillery fire. To have denied enemy observation it would have been necessary to occupy Hill 901. This would have extended the battalion beyond its capabilities and would have allowed it to be defeated in detail.

August 21st was quiet although the 27th Infantry Regiment reported that an enemy force, estimated as two battalions or larger, was on its right flank about due east of

its CP. A patrol was sent out beyond Tunia by the 2d Battalion, 23d Infantry (see Figure 2) but it reported no contact.

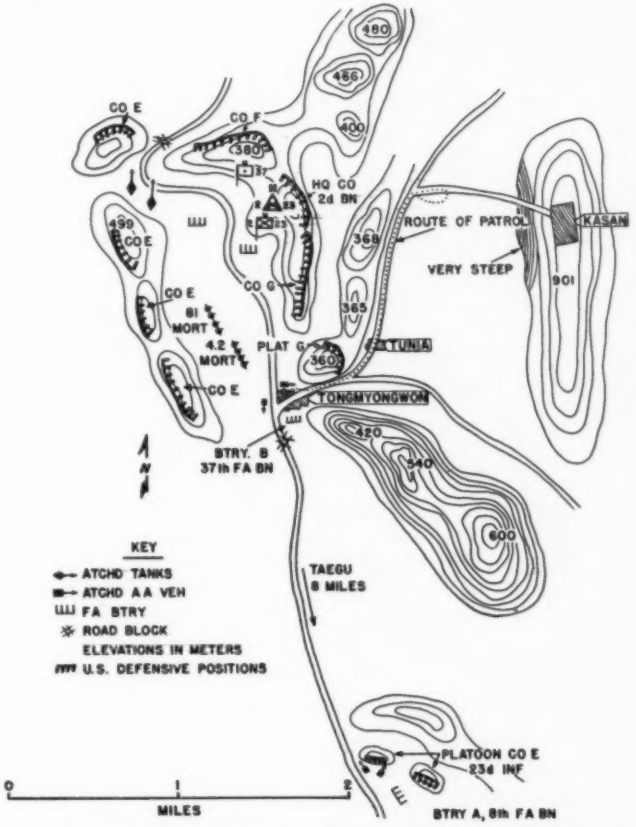

Figure 2. Positions of the 2d Battalion, 23d Infantry Regiment, vicinity of Tongmyongwon, 20-21 August 1950.

During the night of 21-22 August the battalion received about 75 rounds of enemy 82-mm and 120-mm mortar and some artillery fire. The infantry had no casualties, but two artillery men were wounded slightly by one shell. At 0800, five enemy mortar rounds landed in the village of

Tongmyongwon. Company H's mortar platoon began firing at suspected positions near Hill 901. A 4.2-inch mortar platoon was attached to the battalion and arrived at 1100; shortly thereafter it began to fire on suspected OP's on Hill 901. Hill 901 had direct observation of Tongmyongwon, the road at this point, and the battery of field artillery located near the village. (See Figure 2.) The enemy mortar and artillery fire became extremely accurate. A 75-mm recoilless rifle took position in Company G's area and also began firing on suspected OP's.

Replacements had arrived at 0800. They brought all companies of the battalion to 98% of T/O strength.

A platoon of Company G occupied the reverse slope of Hill 360. At about 1300 the battalion OP reported about 50 enemy troops approaching this hill. The battalion commander ordered the platoon of Company G to secure the crest of Hill 360. At this time, a unit of the 1st South Korean Division (150 engineer recruits) appeared in Company G's area on Hill 360. A Japanese-American soldier was sent from battalion headquarters to contact this group and have them help Company G's platoon secure the crest of Hill 360. The enemy group advancing toward the Hill now swelled to about 200. The two forces collided on the hillcrest. Company G's platoon continued the attack by fire and movement in spite of heavy enemy fire and the loss of its platoon leader and platoon sergeant.

The platoon received some assistance from the South Korean unit despite the fact they were green.

At this time one platoon of Company E was ordered to assist Company G's platoon in the attack on Hill 360; at the same time the rest of Company E was ordered to come down from their ridge positions (see Figure 3) and assemble back of Company G's right flank as battalion reserve.

The reinforcing platoon from Company E came up to the right of Company G's platoon and both units continued the attack, supported by artillery and 4.2-inch mortar fire. The platoon of Company E, advancing in the face of heavy machine gun fire, forced 50 North Koreans off their por-

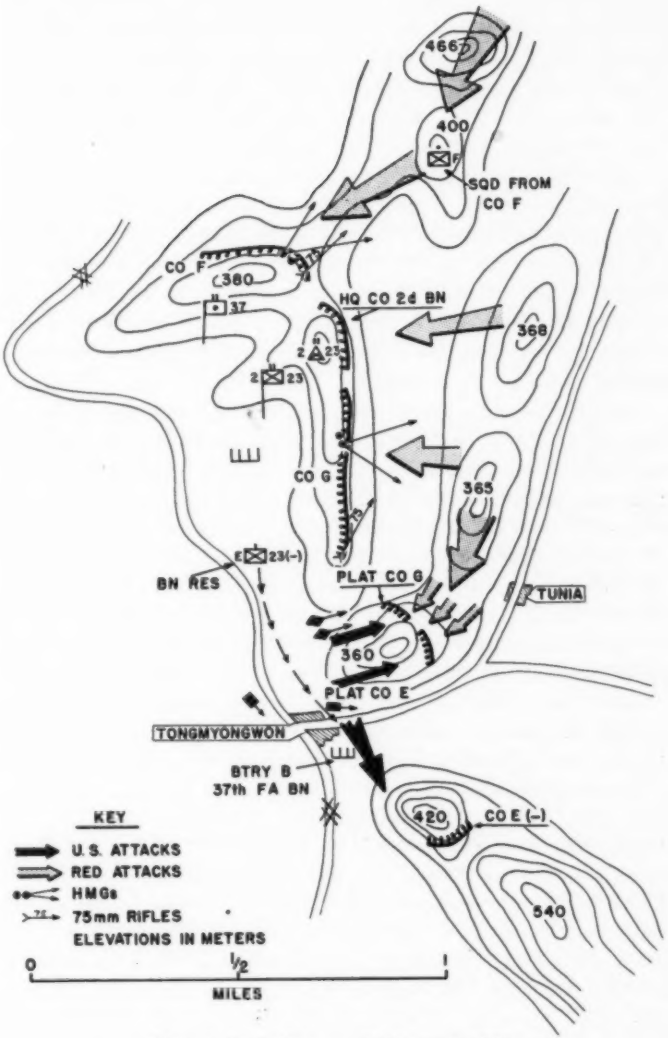

Figure 3. Action on 22 August 1950.

tion of Hill 360, killing most of them. At the same time Company G's platoon and the 150 South Korean engineers came abreast of Company E's platoon, clearing about 150 North Koreans from the crest. Hill 360 was firmly within our grasp by 1500. *All units employed marching fire as they advanced with excellent results.*

The troops on Hill 360 now started to receive mortar and machine gun fire from the village of Tunia (see Figure 2). Artillery, 4.2-inch, and 81-mm mortar fire was promptly brought down on the village, setting it on fire, and the enemy firing ceased.

The 150 South Korean engineers were ordered to the rear as it was felt that the two U. S. platoons could easily hold Hill 360.

At 1100, Company F was ordered to send a squad to outpost Hill 400 (see Figure 3). This squad was in position by 1200. The lieutenant in command of the 4.2-inch mortar platoon, seeking a better OP for his mortars, went out to Hill 400. At 1300 an enemy force, estimated as about 500, or one battalion, suddenly swarmed over Hill 400 from the direction of Hill 466. The squad from Company F retreated, firing, before this overwhelming force and succeeded in reaching the positions of Company F without casualties, although they were hotly pursued by the Reds.

The lieutenant of the mortar platoon was not so fortunate. He was cut off by the rapid Red advance, run down by the agile Reds and bayoneted to death. American machine guns on Hills 370 and 380 killed several of the Reds, who had killed the officer, and kept any other Reds from his body. The Red avalanche then bore down on Company F, the "Fighting Foxes." Pre-arranged artillery and 81-mm mortar barrages took a terrific toll of North Koreans, but they kept coming in wave after wave. Machine guns, Company F's 60-mm mortars, and riflemen then took another terrible toll and the Reds finally recoiled and withdrew to Hill 400, leaving the ground strewn with their dead and dying. They had never gotten closer than 200 yards. *The Reds cannot stand the massed fires of an infantry battalion whose defense has been well coordinated and integrated*

with supporting artillery. They hate our artillery and mortars with a passion.

At 1530, Company E, minus two platoons, was ordered to take Hill 420 in order to eliminate an enemy group which was firing on Hill 360. (See Figure 3.) Hill 420 was very steep and high. Company E jumped off at 1630, preceded by a ten minute artillery preparation. Aided by 81-mm mortar fire, the Americans advanced relentlessly. North Koreans who were not killed by the supporting fires or who had not fled were quickly shot or bayoneted by the infantry, and by 1730, Hill 420 had fallen. Company E pursued about 50 fleeing Koreans by fire; only about 15 of them reached Tunia.

At about 1400, the battalion commander, who conducted the defense from the battalion OP during the entire day, had requested an additional rifle company from the regimental commander to replace Company E on the hills to the battalion's rear. The regimental commander immediately dispatched Company I to the 2d Battalion area. This company arrived about 1600 and was placed by the battalion executive officer on the hills vacated by Company E (see Figure 2).

A squad patrol from E Company was dispatched to Hill 540 and reached it at 1830 without opposition. The patrol reported no enemy on Hill 540 and returned to Hill 420.

At 1600 an estimated battalion of Reds launched a determined attack against Hill 360. Barrage fires from artillery and 4.2-inch mortars were brought down. What few Koreans got through the curtain of fire were killed by the machine guns and rifles of the Company E and G platoons. The attack was stopped cold and by 1645, the battalion OP reported that the enemy were running back to their original positions.

North Koreans began massing in front of Company F and the center of the battalion sector, Hill 370. (See Figure 2.) At 1650 four P-51's, summoned by the Tactical Air Control Party with the 27th Infantry Regiment, dropped three 500 pound bombs and fired many rockets into the enemy in front of the battalion positions. *The close*

support given the Infantry by the Air Force in Korea is wonderful.

At 1745, five minutes after the air-strike had ended, a new unit, estimated as another battalion, started to move down Hill 400 toward Company F. This unit was evidently composed of "shock troops." They were well equipped and all wore Russian type helmets; other Red units had worn only cloth caps. This battalion was camouflaged very carefully with trees. Each soldier had a small tree tied to the front of him. When he stopped moving and went into the standard Korean squat, he was hard to see. However, with so large a group, quite a few of them were moving at once and it gave the appearance of a forest of small trees approaching.

The enemy on Hills 368 and 365 had evidently been reinforced, since they started toward the center of the American battalion. At 1755 a flight of six A-20 type bombers, led by a South Korean AT-6 spotter plane, flew overhead. The spotter plane located the enemy on Hills 400, 368, and 369 and brought the planes in on them. The bombers dropped eighteen 500-pound bombs on the Reds and then returned to strafe them with .50 caliber machine guns.

This air strike caused the enemy on Hills 365 and 368 to run to the rear in panic, but the "shock troops" on Hill 400 were of different caliber. As soon as the planes left, the enemy on Hill 400 began advancing and Company F's position was soon under heavy mortar and machine gun fire.

At 1900, the four P-51's, which had made the first air strike, returned and strafed all enemy in sight with rockets and .50 caliber machine guns. The P-51's left at 1930 and were almost immediately replaced by F-80 jet planes performing the same mission. Some of the planes strafed as close as 200 yards in front of the battalion positions; this was really close air support! This terrible pounding from the air forced the "shock troops" to flee and join the rest of the disorganized Reds. However, as usual, they reorganized under cover of darkness and were much in evidence again the next day.

At 1900, the platoon of Company E that was protecting Battery A of the 8th Field Artillery Battalion (see Figure 2) was attacked by about 125 North Koreans. This platoon, reinforced by one M-16 and one M-19 of the 82d AAA Battalion and some .50 caliber machine guns and BAR's from Battery A, successfully repulsed this attack, killing 60 Koreans and forcing the rest to flee. The guns of the battery were sighted down the ravines, prepared to deliver direct fire if the North Koreans had broken through the infantry defense.

The night of 22-23 August was comparatively quiet, although the 2d Battalion received some small arms and occasional mortar fire. Front-line companies called for artillery and mortar barrages at intervals during the night, but no attack developed. The Reds apparently had been badly disorganized by the air attacks.

The battalion commander and his staff planned a coordinated attack for the next morning. Company F was to jump off at 0700 and capture Hill 400 and continue to Hill 466 on order; Companies G and H were to support this attack by fire. At 0900, Company G was to jump off and capture Hill 365 and continue to Hill 368 on order; Company E was also to attack at 0900, seize Hill 540 and continue to Hill 600 on order. The regimental commander had ordered the 3d Battalion (less Company I) to advance north east of the road and meet Company E on Hill 600. (See Figure 2.) (The 3d Battalion was occupying a defensive position five miles south of the 2d Battalion.)

Company F jumped off at 0700 with two platoons abreast; each platoon had a 57-mm recoilless rifle attached. Their attack was preceded by a ten minute artillery and 4.2-inch mortar concentration. The infantry moved out and 81-mm mortar concentrations "walked" up the hill 100 yards in front of them. They had advanced about 100 yards when riflemen and a machine gun opened up on the right platoon from Hill 400. The platoon immediately started to maneuver; its advance never faltered. The enemy machine gun had fired only two bursts when it was smothered by the heavy machine guns, Company F's 60-

mm mortars, and the 75-mm recoilless rifle. The 75-mm rifle made a direct hit with its second round. The two infantry platoons advanced at a steady relentless pace. The "Fighting Foxes" were superb fighting men following superior leaders! The Koreans on Hill 400 turned and fled leaving 53 dead bodies. *The artillery and the battalion supporting fires worked beautifully, just like a Fort Benning demonstration.* An enemy 82-mm mortar, setting up on the reverse slope of Hill 400, was hit with the first round by the 75-mm rifle section located on Hill 360. (See Figure 4.) Rifle and machine gun fire from headquarters and Company G kept any Koreans on adjacent hills from taking flanking shots at Company F. The two tanks located between Hills 370 and 360 also knocked out several machine guns and sub-machine guns with cannon and .50 caliber machine gun fire.

Excellent communication made for excellent control and coordination. The battalion commander, at his OP, had direct radio communication to all companies and supporting units and, in addition, had wire to the battalion CP and through the switchboard to all company and supporting unit CP's. To shift fires and the direction of each company's movements was a matter of seconds since the entire area of operations was visible from the OP.

By 0830 both Company F platoons had taken their respective areas of the initial objective (Hill 400). The body of the 4.2-inch mortar platoon lieutenant was recovered.

The support platoon had followed the right platoon. It was now ordered to clean up some enemy snipers on the south slope of Hill 400. (See Figure 4.) These snipers had been directing extremely accurate fire on the battalion OP since 0700 and had wounded five soldiers. The support platoon easily took care of this task. A platoon of Company I was ordered to occupy the defensive positions vacated by Company F. Sporadic 82-mm mortar fire continued to fall all along the battalion positions during the entire day.

Company F was ordered to continue the attack and seize Hill 466. (See Figure 4.) Its 60-mm mortars had

displaced behind Hill 400. After a ten minute artillery and 4.2-inch mortar preparation, Company F jumped off. The battalion commander delayed Companies E and G from

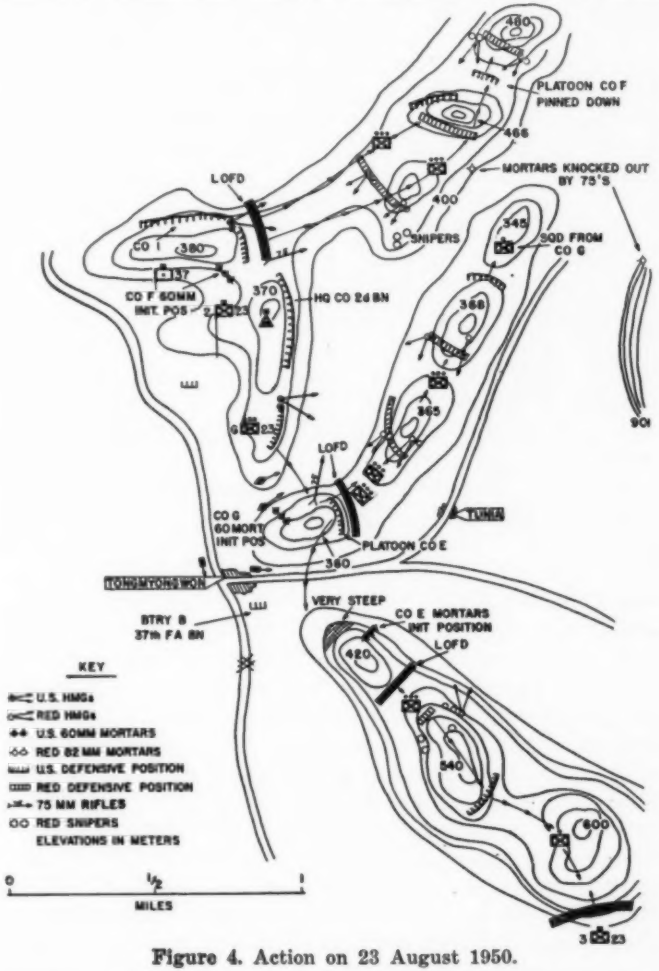

Figure 4. Action on 23 August 1950.

attacking at 0900 until the enemy on Hill 466 could be fully occupied by Company F's attack.

At 0920 Company G was ordered to attack. This company left one platoon in its defensive positions to support the attack on Hill 365 by fire and, as soon as Hill 365 was taken, to follow the company as the support platoon. The commanding officer of Company G decided to attack in a column of platoons, leap-frogging his two remaining rifle platoons from objective to objective. He attached a 57-mm recoilless rifle squad to each platoon and had his 60-mm mortars set up initially behind Hill 360. Company E's attack was delayed still further by the battalion commander as he felt that with Companies F and G attacking there was not enough supporting fire remaining to assist Company E. The Company E platoon on Hill 360 was to remain on and hold Hill 360 until Company G had taken Hill 365; it was then to revert to Company E's control.

A ten minute 4.2-inch, 81-mm, and 60-mm mortar preparation was placed on the enemy on Hill 365 at 0925 and Company G crossed the LOFD at 0935. Since the artillery was busy supporting Company F, it did not participate in the preparation.

Company G's leading platoon immediately ran into considerable resistance in the form of small arms and automatic weapons fire. With the same dauntless courage that Company F had displayed, the leading platoon kept advancing by fire and maneuver. Supporting 4.2-inch, 81-mm, and 60-mm mortars, and machine guns soon took care of all the enemy machine guns. The 75-mm rifle on Hill 380 knocked out, with its second round, a mortar going into position in plain view on the slopes of Hill 901. (See Figure 4.) The mortar must have been at least 2,000 yards away. Strange as it may seem, the 57-mm and 75-mm rifles never received a single round of counter-battery fire. This can only be explained by the fact that enemy mortar shells were falling on all of our positions intermittently and that the backblasts of the recoilless weapons were mistaken by the enemy for bursts of their mortars. *The 57-mm and 75-mm rifles are very accurate weapons and really sold themselves to the infantry in this action.*

Employing marching fire, the leading platoon of Company G reached the summit of Hill 365 and, after a stiff

hand-to-hand fight with many grenades thrown by either side, succeeded in routing the enemy from the hill at 1050. Thirty-eight dead Korean bodies were later buried on this hill. The 60-mm mortars displaced to a position southwest of Hill 365.

Company G was ordered to continue the attack. The second platoon leap-frogged through the leading platoon and, preceded by an 81-mm mortar barrage, advanced toward Hill 368. *The perfect use of fire and movement with superbly coordinated supporting fire once again gained another victory.* Although encountering fanatical resistance all the way, the Company G platoon had secured Hill 368 by 1145. Company G was then ordered to hold in place and reconnoiter Hill 345. (See Figure 4.) The assault platoon, seeing no visible enemy on the hill, dispatched a squad patrol to the hill. The patrol reached the top of the hill without encountering any enemy and remained in observation there during the remainder of the afternoon.

During its attack, Company G had received considerable flanking mortar fire from Hill 901 and its walled city of Kasan. (See Figure 1.) At 1100, an air strike hit Kasan and set it on fire. The 4.2-inch mortar platoon marked the target for the planes by firing white phosphorous shells on Kasan. This was the standard way of marking targets for air strikes.

Company F had not fared so well in its attack on Hill 466. Deprived of most of its supporting 4.2-inch and 81-mm mortar support because of Company G's attack, Company F made very slow progress against the fanatical resistance of the "shock troops." In addition, Company F received very heavy mortar fire (82-mm and 120-mm mortars) from Hill 901.

Finally, at 1130 the bulk of the 4.2-inch and 81-mm mortar fire was again given to Company F. This, combined with the air strike on Hill 901, followed by artillery fire on the same hill, relieved the pressure on the company whose two assault platoons had been pinned to the ground for almost two hours. Employing his support platoon to

relieve the right assault platoon which had had several casualties, the Company F commander continued the attack. The assault platoons passed to the right and left of the crest and the Koreans, fearing encirclement, started to run off the back of the hill. The right platoon which was a little ahead of the left, seeing this, ran after them in hot pursuit and killed many.

The Koreans ran up Hill 480. When the Company F platoon arrived in the valley between Hills 466 and 480, enemy machine guns emplaced on the flanks of Hill 480 opened up flanking fire on the platoon. At the same time several of the *dead* Koreans jumped up and started shooting Americans in the back. The platoon leader was seriously wounded, the platoon sergeant and three others killed, and ten other wounded in a matter of a few minutes. The rest of the platoon was pinned to the ground unable to move. The company commander, coming up with the other platoon, immediately brought down artillery and mortar fire on Hill 480. The pinned down platoon, under cover of these fires and the overhead fire of the support platoon, crawled back with its wounded and two of the four dead. Two of the dead could not be reached without incurring further casualties. The men crawling back with the wounded were special targets for the North Korean machine gunners. However, all reached the safety of Hill 466 without further casualties. In view of the strong opposition on Hill 480 and Company F's casualties, the battalion commander ordered the company to reorganize and defend Hill 466; this organization was completed at about 1430.

At 1130 Company E was ordered to attack Hill 540. The company attacked in a column of platoons with a 57-mm rifle squad attached to each platoon. (See Figure 4.) Company E planned to leapfrog its two rifle platoons just as Company G had done. The 60-mm mortars occupied an initial position on Hill 420. A ten minute artillery preparation was placed on Hill 540 from 1135 to 1145 and the leading platoon crossed the LOFD at 1140. It met only slight resistance from one small enemy group, one machine gun, and a few snipers. These were methodically

and efficiently eliminated by fire and maneuver and 60-mm mortar fire. By 1300, Company E was in complete possession of Hill 540. Since no enemy were seen on Hill 600, a squad patrol was dispatched immediately to this hill. The patrol encountered no resistance and was on the crest of Hill 600 at 1355. At 1400 this squad made contact with the leading elements of the 3d Battalion, 23d Infantry Regiment, which had advanced from the south. After this contact, the 3d Battalion withdrew to its orginal defensive positions and the squad remained in observation for the rest of the day.

From 1400 to 1630, all companies of the battalion reorganized, straightened out their lines, and mopped up small groups and snipers by-passed by the attacks of the day. There were no organized enemy remaining in front of Company G and Company E. All that had not been killed were observed fleeing to the northeast. The enemy in front of Company F on Hill 480 had been so badly mauled by Company F, the artillery, and the mortars that they were in no shape for any aggressive action. The success of the battalion's limited objective attacks can probably be attributed to the fact that the Koreans were completely surprised to have U. S. troops attack them aggressively; all our units up to this time had been on the defensive and the Koreans were not prepared for the hard hitting attacks of the battalion.

At 1630 mortar fire was still coming from Hill 901 and Kasan. At this time another bombing and strafing air strike hit the hill and the town. In spite of this, at 1730 hours, 16 mortar shells landed in the CP, OP, and Company F areas. The mortars were picked up on Hill 901 by an air spotter and, at 1800, another air strike dumped napalm on the mortars and silenced them.

The Koreans on Hill 901 had direct observation down the valley in Tongmyongwon; at 0700 they started to shell the village and interdict the road with 82-mm and 120-mm mortars. Between 0900 and 1100 two of the guns of Battery B, 37th Field Artillery Battalion, and an ammunition truck suffered direct hits. Three gunners were killed and six wounded. Artillerymen and mortar crews continued to

man their weapons and execute fire missions while enemy mortar shells burst among them. By 1200 the enemy mortar shells were arriving in such great quantities on Tongmyongwon and the road, that Battery B was ordered to evacuate its position and all unnecessary traffic was stopped on the road. Command and necessary communications vehicles had to "run the gauntlet" of shell-fire at high speed. Battery B was moved to another position about one mile south of Battery A of the 8th Field Artillery Battalion (see Figure 1). Since this was also an unprotected area, a platoon of Company I was ordered back to protect this battery. The shelling of Tongmyongwon and the road continued throughout the day.

At night the burning village of Tongmyongwon cast an eerie light over the valley. Company F, prior to dark, had registered artillery fires 100 yards in front of Hill 466 and 81-mm mortar fire 75 yards in front of the same hill. *This was characteristic of this period of the Korean Campaign; the defensive fires were always brought in very close.*

Prior to dark, Company G was ordered to withdraw to the positions it had held that morning before its attack. (See Figure 3.) Company E was ordered to remain on Hills 420 and 540. Supporting fires were registered and coordinated and the battalion "buttoned up" for the night.

At 2100 the "*shock troops*" in front of Company F, reinforced by fresh troops, attempted one of the famous North Korean sneak night attacks. Crawling like animals through the brush, the Koreans attempted to get within grenade throwing distance. Alert sentinels discovered them and gave the alarm. The artillery barrage of the final protective fires came down and the artillery continued firing it for 30 minutes. The 81-mm mortars came down within 75 yards of the front line and, while the infantry crouched low in their holes to avoid our mortar fragments, continued to pound the enemy for 30 minutes. After the barrages had ceased the screams of the dying and wounded Koreans could be heard.

Another artillery and mortar concentration was placed in the same place and then another one on Hill 480. When

they ceased, most of the screams had been silenced and the aggressive attitude of the "shock troops" had been severely dampened. In fact, next morning Company F found that Hill 480 had been completely abandoned by the enemy. At 0500 the battalion OP reported sounds that indicated the enemy was attempting to assemble in the valley in front of the OP. A pre-arranged 4.2-inch mortar concentration was placed in the valley and the sounds ceased.

At dawn, 24 August 1950, not an enemy was in sight. Company F was ordered to send a platoon to Hill 480. This platoon reached Hill 480 without incident and saw over 200 dead bodies and parts of bodies on the way to the crest of the hill. About two-thirds of the North Korean dead had been killed by artillery and mortar fire.

Two South Korean battalions attacked Hill 901 and Kasan in the morning and by night had succeeded in routing the badly mauled North Koreans from the hill, thus ending the action. Throughout the day the battalion sent out patrols to gather up enemy weapons and to count the dead. Five hundred twenty-three North Korean bodies were counted. In addition there were many pieces of bodies.

The 1st North Korean regimental flag was taken from the body of a dead officer; this was the flag that was to have been flown from the city hall of Taegu. It was so ridddled by machine gun and mortar fire that it looked moth eaten. Six prisoners, including one officer, were taken. These prisoners said they had been told that it would take their regiment but a few minutes to overrun American artillery and that they could then be in Taegu in another two hours.

The 2d Battalion's casualties were six killed and 31 wounded; most of the casualties were from Company F. This was the initial action of the battalion in the Korean Campaign and morale was very high as the "Second to None'" Battalion had erased the North Korean 1st Infantry Regiment from Red muster rolls. General Walker, Eighth Army Commander, when he had been informed of the action, said, "The Second Battalion of the 23d Infantry Regiment saved Taegu."

SCR-300: Aircraft Radio

By Lt Chester R. Mead, Infantry

This method of installing an SCR-300 in the L-5 type aircraft for air-to-ground communication does not take into account the possibility of such installation in the newer type liaison airplanes. It is presented as an interesting and useful expedient originated by the author who, at the time of writing, was working with L-5 type aircraft. The QUARTERLY expects to print, in the near future, a similar article on installation of the AN/PRC-10 (new replacement radio for the SCR-300) in the newer liaison planes.

Why not increase the value of the SCR-300 radio, already one of the most valuable as well as most numerous radio sets in the infantry regiment? Why not make it an air-ground liaison set? How can we do this? By installing it in the L-5 type aircraft.

This is not a new idea. The "300-set" has been used in the L-5 before, but only on the basis of hasty improvisation. Usually the observer has carried the set on his lap. This has greatly restricted his freedom of movement and lowered his operating efficiency.

In cases where the pilot had no observer, he had to preset frequencies and trust to luck that stations were tuned properly.

Operating efficiency of the set suffered when it was merely carried in the airplane. The antenna rigs possible in such cases definitely limited the range of the radio.

But it is possible to install the SCR-300 so that it operates extremely efficiently; so that it is out of the way of an observer; and so that the pilot, if alone, can easily tune it or change channels.

Too bulky when completely assembled, the secret of handy installation of the SCR-300 lies in separating the battery (BA-70) and its case (CS-128-A) from the receiver-transmitter portion of the set. By extending the battery cable plug about 10 feet the SCR-300 can become an excellent aircraft radio. (See cable extension, Figure 1.)

In the L-5 type aircraft, the battery and case are placed just aft of the camera mount installation, as shown in Figure 2.

Installation at this point does not appreciably affect the airplane's center of gravity since the case and battery together weigh only 15.10 pounds. The case rests squarely

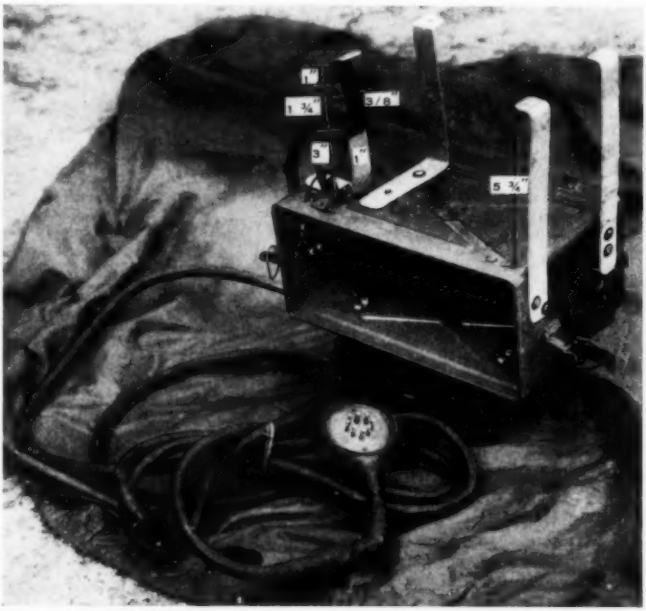

Figure 1. An extension cable connects the battery and the receiver-transmitter when these parts are separated in aircraft installation of the SCR-300. Note the sizes and method of constructing metal straps used to support the receiver-transmitter component beneath the regular aircraft radios.

on V-shaped longerons on the bottom of the aircraft and is firmly attached to a horizontal longeron by means of metal clips welded to the case and hooked over the longeron. To insure keeping the case in place despite any aircraft movement, the case is strapped securely to the longeron. (See Figures 2 and 3.)

The receiver and transmitter portion of the set is easily installed directly under the aircraft's regular Carlson Receiver AN/ARR-13 and the RCA Receiver AVR-20A. One-inch aluminum straps suspend the set from the rubber shock mounts of the RCA Receiver AVR-20A. The rubber mounting reduces vibration to a minimum. (See Figures 1, 4, and 5.)

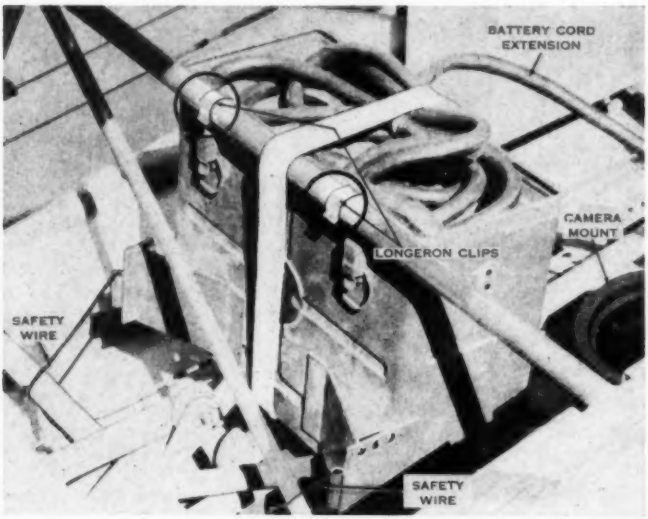

Figure 2. The battery and case are placed just aft of the aircraft camera mount. Note belt, safety wires, and longeron clips used to secure the case.

The SCR-300 uses the aircraft's reguiar antenna. This is made possible by attaching a six-inch shielded wire from the SCR-300's antenna outlet to the antenna lead-in on the RCA Receiver AVR-20A.

As a precautionary measure, the SCR-300 can be grounded without affecting either transmitting or receiving performance.

Experiments show that the whip-type aircraft antenna works better than the "V" type which runs from wing

tips to tail. This latter type has a tendency to produce much weaker signal strength when the plane is heading toward or away from the transmitting station. If the "V"-type is used, signal strength can be increased by heading the plane at a 90-degree angle from the direction of the transmitting station. In any case, this fault is not serious within a radius of 20 to 30 miles, under normal operating conditions.

Use of the antenna RC-291 on the SCR-300 used on the ground greatly improves air-to-ground performance.

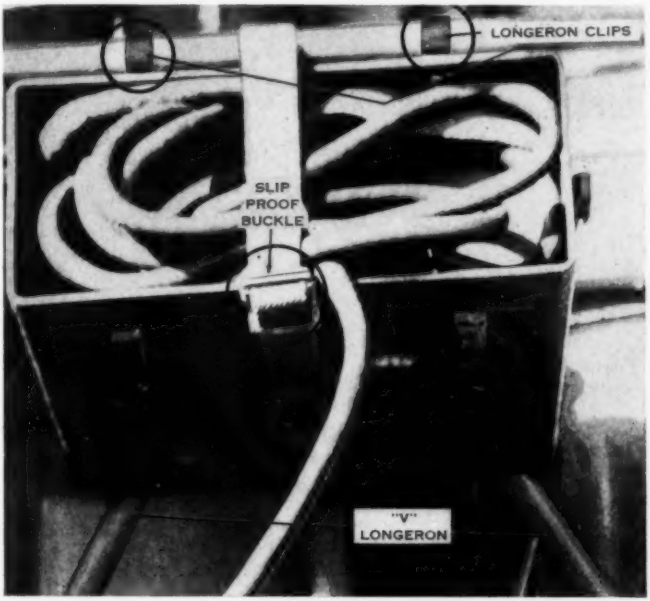

Figure 3. The battery case rests on the "V" longerons. The belt is secured with a slip-proof buckle.

Transmitting and receiving performance, under ideal conditions, are far superior to ground-to-ground performance. I have transmitted and received signals LOUD AND CLEAR at a distance of sixty miles from the ground set when the airplane was at 6000 feet altitude. Altitude and terrain are critical factors in both transmitting and

receiving performance. However, over normally flat terrain an altitude of only 400 feet is required to transmit and receive over distances of 20 to 30 miles. This should suffice for normal combat conditions.

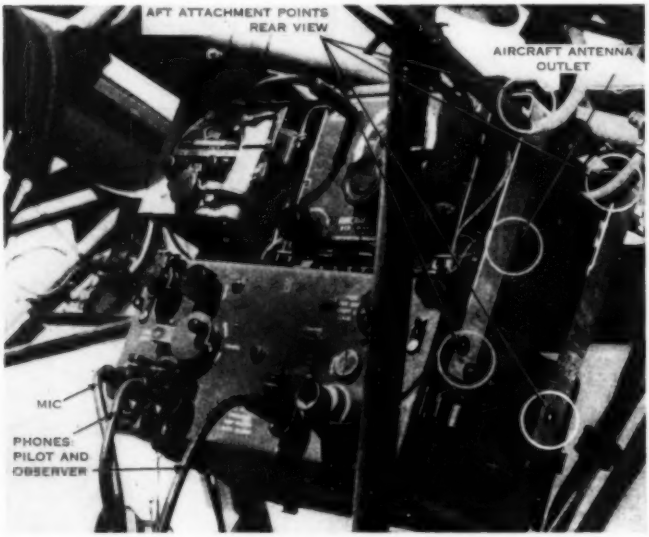

Figure 4. Receiver-transmitter installation as viewed from the observer's seat.

Installation of the SCR-300 in the Infantry division's L-5 aircraft gives both air and ground echelons greater flexibility of communication. The frequency coverage of the set - 40.0 to 48.0 megacycles - allows 41 voice channels of air-ground communication. This permits the aircraft to work directly with units - rifle companies for instance - which is not possible with regular aircraft communication equipment.

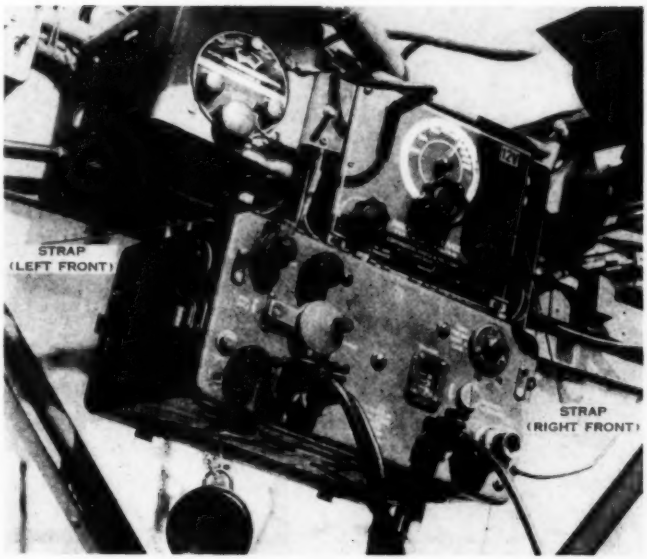

Figure 5. Receiver transmitter installation as viewed from the pilot's seat.

Puzzled by some point on tactics, weapons employment, or any other question on infantry? . . . The QUARTERLY will get the answer for you. Write to: Editor, INFANTRY SCHOOL QUARTERLY, Fort Benning, Georgia.

Death of the Glider

By Maj Edward M. Flanagan, Artillery

Editor's Note: This article reflects the opinion of the writer, not necessarily that of The Infantry School.

"In the plans for the defense of our nation, the Army has been assigned a major role that requires that we be ready at all times to move by the fastest means and with the greatest fire power and logistical support.

"Therefore, we in the Army must place increasing emphasis upon transportation by air, and more of our personnel and equipment must be prepared to move by that means.

"For I am convinced that if war ever comes again, airborne operations will play a far more vital part than ever before."

— General J. Lawton Collins, Chief of Staff, U. S. Army.

In World War II, airborne divisions spent long periods of combat fighting as ground units. Most probably such will be the case in the event of a future major war. Therefore, our planners decided the strength of the airborne division had to be beefed up. That has been done.

The new airborne division has only about 1200 men less than the infantry division; it has two organic tank battalions; and it has one organic 155-mm howitzer battalion plus three battalions of 105's. For all intents and purposes, an airborne division is an infantry division whose soldiers *jump* into combat instead of walking or riding.

Once combat has been joined, an airborne division with its new T/O&E can endure sustained combat to the same degree as its older brother, the infantry division. That is— it can if it's resupplied in the proper amounts.

How supply it? Use the glider? — Use a new version of World War II's oversized kite — vibrating bag of plywood

and canvas; nose-diving, hedge-cutting, crash-happy, man and equipment-killer?

Let the fragile sky-sailer bring in the artillery? The vehicles? The antitank weapons so necessary against an armor conscious enemy trying desperately to reduce the airhead? The bulldozers? The supplies of food, ammunition, and fuel that the initial assault waves need so critically. Trust all this to the glider? If not, what then? The answer—

THE HEAVY DROP TECHNIQUE

For the past four years the Airborne Test Section of Army Field Forces Board No. 1 at Fort Bragg, North Carolina, in conjunction with a representative of the Air Material Command, has been working on the heavy drop technique. Some of their initial efforts resulted in scattering over the drop zone nuts and bolts and pieces of jeeps which had descended to the ground without the sustaining benefit of their parachutes. Malfunctions occured. A howitzer buried itself in the ground barrel-first, up to its wheels, because it also reached the earth too impatiently and without waiting for its parachute to blossom. But four years of work have ironed out the wrinkles in the technique. It is so far developed that the procedure is almost standard.

AFF Board No. 1 conducts a school at Fort Bragg to teach the airborne divisions and the service schools' airborne departments how to use the heavy drop kits. But there's no mystery to their use. It doesn't take a graduate engineer to rig a jeep or a 105 howitzer for dropping. It doesn't require a specialist's skill. The Board conducts the course because right now it has the know-how based upon valuable experience gained through many drops, the latter ones having been almost completely successful. The course is so designed that the technique—like the servicing of a crew-served weapon — can be taught and learned by the numbers. SOP — you do this first, then you do that, and in an amazingly short time the piece of equipment is ready to be loaded in the aircraft ready for dropping.

The minute details of the system are of little concern to us. But, broadly speaking, to rig a jeep for dropping,

the procedure (see Figure 1) is something like this: Drive the jeep up on a platform which is sturdily constructed, weighs 450 pounds, and measures 80″ × 11′. Put some shock pads under the axles and under the motor of the jeep (that's to keep the motor and transmission from continuing on their own into the earth when the jeep hits the ground). Lash the platform to the jeep. Attach the suspension webs to the jeep. Attach the parachute risers to the suspension webs which have been attached to the bumper and the jeep frame through the floor in the front of the jeep. Put the parachute box on the rear of the jeep. Put the 100-foot parachute in the box. Attach its risers to the suspension webs. Roughly speaking, the jeep is now ready to be dropped.

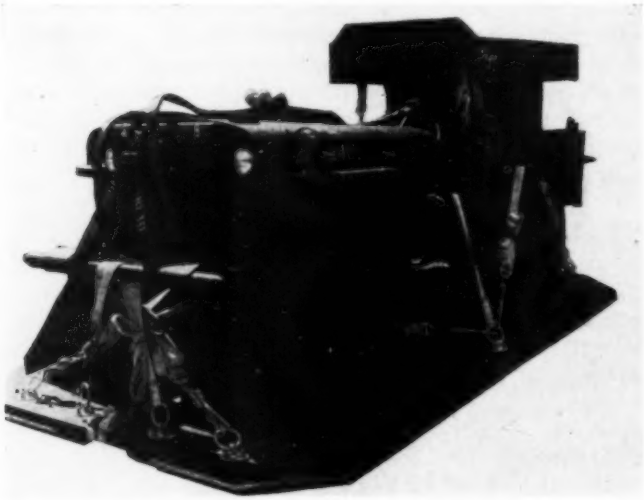

Figure 1. A jeep rigged for heavy drop. Note the suspension web attached to the front bumper. The other suspension web goes to the frame of the jeep through the jeep's front seat floor area. Note the parachute box on the jeep's rear. The 100′ chute is not in the box in this picture.

In general, the same system applies to a howitzer, a load of ammunition or rations, or a ¾-ton truck. (See Figures 2 and 3.) Basically, you've got: (1) a platform, (2) a means

of tying the platform to the load, (3) a means of tying one or more parachutes (100 feet in diameter) to the load, and (4) a device for starting a chain reaction in the aircraft to cause the load to exit from the plane at the proper time.

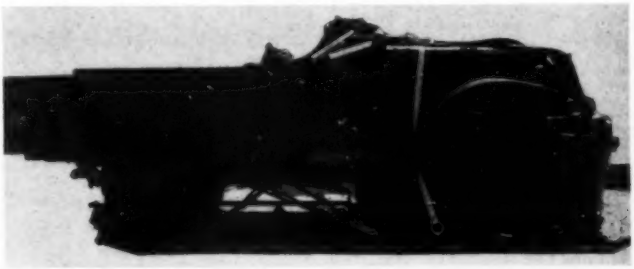

Figure 2. A ¾-ton truck ready for dropping. Note the stripped condition of the truck. Note the shock absorber under the front bumper and the pads under the oil pan.

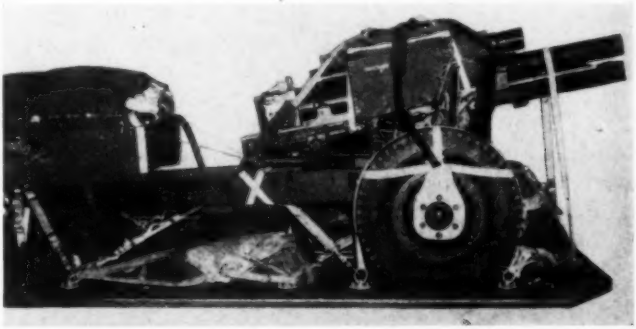

Figure 3. A 105-mm howitzer ready for dropping. Note the suspension webs running from the brackets on the wheels, from the tube, and from the trails. Note the shock pads under the trails. The tube is locked out of battery to give the weapon balance. A jeep can be dropped from the same plane that drops the 105-mm howitzer.

Item 4, above, the device to start the load out of the plane and to deploy the main parachute or parachutes, is also simple. It consists of a very small parachute, the pilot chute (30 inches in diameter), which is rolled up in a ball and

placed on the floor of the aircraft near the rear opening of the plane. A line from the pilot chute is attached to the apex of the drag chute, a 16-foot ribbon chute; and, finally, a line from the drag chute is attached (1) to the apex of the main parachute, and (2) to the platform upon which rests the load to be dropped.

We are now over the DZ (drop zone), ready to drop. The platform is resting on conveyer rollers in the aircraft. The pilot of the plane, the only man who can accurately judge when the load should be released, gives the signal for the drop. We are ready for the chain reaction. A man in the cargo compartment, well forward in the plane (in front of the load, since the load will exit to the rear through the opening of the plane), activates the pilot chute by means of a long cable which runs along the floor of the plane. (The pilot chute is attached at one end to the drag chute and at the other end to a five pound shot bag carried in the glider tow receptacle of the aircraft. Prior to giving the signal for drop, the pilot releases the glider tow attachment, permitting the shot bag to fall and exert a drag on the pilot parachute.) When the man in the cargo compartment pulls the cable, the pilot chute is released and pulled out of the aircraft by the shot bag. The small chute opens and pulls on the drag chute, the 16-foot one. The 16-foot chute comes out of the plane and opens. It in turn does two things: Since it is attached to the platform, it starts the load out of the aircraft. The platform rides on a conveyer and its exit is rapid and easy. The whole load rolls out of the aircraft. Obviously, a 16-foot parachute cannot lower a load weighing some 3,000 pounds to the ground. (An individual jumper uses a 28-foot parachute.) So the next step takes place. The 100-foot parachute or parachutes (depending upon weight of the load), using the 16-foot drag chute as an anchor (like the anchor line in an aircraft to which the individual jumper hooks up when he is about to jump) are deployed and they lower the load to the ground.

In essence that is the heavy drop technique. But more to the point, what can this heavy drop system do? What loads

can it deliver to the airhead? Why are we so certain that the glider should be relegated to a spot in the Smithsonian Institute. Here's why —

HEAVY DROP CAPABILITIES

The heavy drop can deliver any of the loads that the old American gliders of World War II fame could deliver. Right now, today, with no more experimentation, it can lower a jeep, a 105-mm howitzer, a ¾-ton truck, a 40-mm AA gun, a 90-mm AT gun (see Figure 4), and a weasel. It can also lower comparable loads of supplies. (One 100-foot canopy can support 3,500 pounds at a rate of descent of 25 feet per second. Two 100-foot parachutes can handle nearly twice that amount, which, incidentally, appears to be an efficient system of getting a large quanity of bulk supplies concentrated rapidly in a given area.)

Figure 4. A 90-mm AT gun ready for dropping. Note that the tube is retracted and locked out of battery.

With more development and more experimentation, it's only a step to dropping a 155-mm howitzer, a 2½-ton truck, and a D-4 dozer. Work is now being conducted along those lines and before long heavier drops will be out of the test phase and ready for use by the airborne divisions. It's just a matter of rigging the loads so that they will be protected from damage when they land. In that connection, it appears that the 155-mm howitzer will present very little difficulty, whereas the 2½-ton truck, with many working parts suspended underneath it, will present a problem, but not an insurmountable one. The solution will probably consist of

inserting many shock pads between the platform and all parts of the truck — transmission, springs, motor, etc. — which could jar loose when the load hits. There are problems, yes, but consider the advantages—

ADVANTAGES OF HEAVY DROP

1. *Lower cost.* The heavy drop kits at the present time without mass production, are produced for about $3,000 to $5,000, the difference in cost depending on the number of 100-foot canopies with each kit. (A jeep needs only one, but a 105-mm howitzer needs two.) On the other hand, a glider costs at least five or six times that figure, and gliders were mass-produced. One might argue that the glider could be used over and over again. That is not exactly true. Rare was the glider that arrived undamaged on a landing zone in combat and rarer still was the glider which was returned for use again. I feel that the heavy drop kits can be recovered and used again, certainly more often than was the glider of World War II. It would seem then that the heavy drop system is less expensive than the glider deliver system—and expense is an important consideration in an all-out war.

2. *Shorter aircraft columns* will be possible. A glider is towed behind a normally empty tug aircraft on the end of a 300-foot nylon rope. For each glider (or number of gliders, depending upon the width of the glider column), the column will be shortened by 300-feet. And when we consider the number of gliders used on an airborne mission in World War II, those 300-foot lengths rapidly multiply into a distance measured in miles. Obviously, the shorter the column flying over the enemy AA positions, and the shorter the column that our fighters have to protect, the better. And the shorter the column, the more rapidly will the airhead be built up. And, logically, the more rapidly we build up the airhead, the more rapidly can we accomplish the mission.

3. *Loading at the airfield will be faster.* With gliders, the airborne units had to load them at congested airfields. Men and equipment became concentrated in a small area. They made lucrative targets for enemy bombs. On the other hand,

with the heavy drop system the platforms can be loaded and rigged, ready for loading into the aircraft at a place distant from the airfield. The loaded platforms can then be trucked to the transport aircraft and loaded quickly — on an airfield uncluttered by gliders. It's obviously easier to mount an airborne operation in which there are no gliders than to mount one wherein gliders have to be stacked at the end of the runway. The planes must taxi out slowly from the sides, the gliders must be hooked up to the planes, then the tandem affair has to take off — and the slow, time-and-space-consuming process must be repeated on succeeding planes and gliders.

4. *The heavy drop kit can be landed on terrain* unsuitable for glider landings. Even the smallest glider has to have open terrain for its descent, glide, and landing. A drop, on the other hand, can be put in an area which is smaller and not as smooth and open as required for glider landings. The size of the drop area is, of course, dependent on the accuracy of the pilot and the size of the formation of aircraft which will drop their loads simultaneously.

5. *The need for glider pilots is eliminated* — a tremendous saving of highly trained men.

But let's look at the disadvantages too —

DISADVANTAGES

1. *Once a load has left the security of the mother aircraft, it's on its own.* Unlike a glider, a dropped load obviously cannot be steered. This is why loads are packed and the platform designed to absorb shock. The platform absorbs and spreads out the shock of landing on uneven ground, on a rock, or a small shrub.

2. *Recovery of heavy drop kits from a combat zone will be difficult.*

3. *More C-119-type aircraft will be needed* for heavy drop. Gliders can be towed by the commercial type aircraft, the C-46 and C-47, but heavy drops can presently be made only from C-82 and C-119 type aircraft.

Having recognized the disadvantages, let us look at a—

PROPOSED HEAVY DROP ORGANIZATION IN THE AIRBORNE DIVISION

The questions of who will be responsible for the heavy drop kits, who will maintain them, and who will pack and rig them need answers. The first solution might be to turn the job over to the already existing Airborne Quartermaster Parachute Maintenance Company where the know-how can be concentrated and the facilities centralized*. I don't agree with this solution because of the tremendous work load already imposed upon this company. Even now, doing its ordinary job of packing personnel and small equipment chutes and maintaining equipment, the Parachute Maintenance Company must have its strength augmented. To superimpose an additional task on an already over-worked company seems impractical. Why not, then, form another company or companies on division level solely to handle the heavy drop? This would appear to be a workable solution, but first we need to decentralize many of the tasks because of the enormous amount of work involved — but how far to decentralize? I feel that each howitzer section in the artillery battalions should be able to rig its weapon for a heavy drop, just as each pack 75-mm section in the old airborne division knew how to pack its 75-mm howitzer for dropping in para-crates. I believe that the 105-mm howitzer section is capable of learning the heavy drop technique. With the standardization of the heavy drop system (already accomplished for the jeep, 105-mm howitzer, and ¾-ton truck), with a little instruction and much practical work, each howitzer section can become adept in the use of heavy drop kits.

In the infantry I feel that the service company in the infantry regiment, plus additional trained men from the regiment (AT gun crews, for example), can accomplish the task.

This then is my proposal: Issue the heavy drop kits to each organization which requires them through the normal

*Note: An article on the AIRBORNE QUARTERMASTER PARACHUTE MAINTENANCE COMPANY appeared in the October 1950 issue of the INFANTRY SCHOOL QUARTERLY.

supply channels. They will then have the heavy drop kits for crew training. Train the howitzer sections, the service companies, and additional men throughout the regiments and special units to rig their own particular items of equipment for the heavy drop. Train the individual crews to load and lash their equipment to the platforms. I believe, however, that packing and maintaining the 100-foot chutes, rigging the aircraft, connecting the quick release devices, and checking the loaded aircraft must be done by men more expertly trained than the individual sections.

For this job, I propose returning to division level. Authorize a Parachute Maintenance Battalion with an organization similar to that shown in Figure 5.

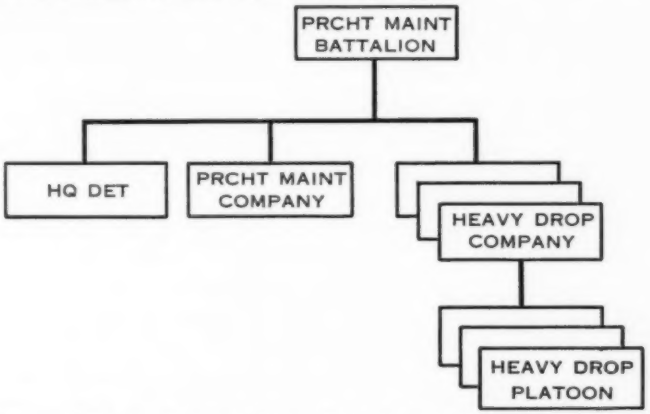

Figure 5. Proposed organization of the Parachute Maintenance Battalion.

The Airborne Quartermaster Parachute Maintenance Company continues to perform its present functions, consisting mainly of packing, maintaining, and storing personnel parachutes. In the marshaling area, assign the three heavy drop companies as follows: one company for the three infantry regiments, with one platoon to each regiment; one company to division artillery; and one company to division special units. This seems to be preponderantly in favor of the artillery and special units but realize that

the five artillery battalions (three 105-mm Battalions, one 155-mm Battalion, and the AA Battalions have a tremendous amount of heavy equipment to be dropped. Consider further the heavy equipment of the Engineer Battalion, the Reconnaissance Company, and the Medical Battalion, and it appears that the special units also need a company.

Let the heavy drop company or platoon commander be the heavy drop expert for each unit. Train the members of the company or platoon thoroughly in loading and lashing all items within the organization for which they work. They are the experts to guide and assist these units in heavy drop technique. The intricacies of the quick release device, the field repair of the 100-foot parachute, and the packing of all the parachutes might well be beyond either the scope or the capabilities of the individual sections within the combat units.

For an actual operation, I visualize the procedure this way: Each of the heavy drop units establishes a heavy drop area for the combat unit with which it is to work. Working on a time schedule, and the shorter the time the larger the area needed, each unit to be transported brings its equipment to the area and loads the platforms under supervision of heavy drop personnel. The equipment, ready for transportation to the aircraft, is then set aside (or in the event that speed is essential, is transported to and loaded on the aircraft) and the next unit arrives and packs its loads. Meanwhile the heavy drop experts from the heavy drop companies have readied the aircraft for dropping—installed the release devices and the conveyer systems in the planes. The flat beds roll up to the aircraft. The crews who packed the loads accompany them to the planes. Under the guidance of the heavy drop experts from the Parachute Maintenance Battalion, the crews load their planes, lash the loads in the aircraft, and check all tie-downs and all fittings. The experts then make the final check before declaring the planes ready for take off.

The functions, then, of the Parachute Maintenance Battalion are these: (1) the Parachute Maintenance Company performs its customary tasks, i.e., packing, maintaining,

storing, and issuing personnel chutes; (2) the Heavy Drop Companies pack, maintain, store, and issue heavy drop parachutes; they prepare aircraft for the heavy drop, i.e., remove clamshell doors and install conveyers; they check all loads prepared for dropping by the men of the combat units; they assist and guide the combat units; they make a final check of the aircraft after planes have been loaded by the combat crews.

CARGO AIRCRAFT FOR HEAVY DROP

One big problem which now prevents complete adoption of the heavy drop technique is the availability of cargo aircraft suitable for dropping heavy equipment. The personnel carriers, C-46, C-47, and C-54, are not suitable for heavy drop. These planes have no rear exits. The C-119** is the aircraft we need in great number. It has removable, clamshell doors in the rear of the plane, the type exit needed. Right now we don't have enough of these planes to transport troops and equipment at the same time. The only solution I can offer to this problem of aircraft shortage is to use on a combat mission, the C-119 for heavy drop and the C-47 and possibly the C-54 for dropping personnel. Some such compromise solution will have to be accepted until the C-119 or comparable type cargo aircraft is produced in sufficient quantity to provide the airborne divisions with the aircraft they need.

This article does not propose that all development on the new pod carriers, the cargo helicopter, or the cargo transports cease — far from it. Development of new cargo carriers, both conventional and of radically new design, must continue. Like everything else, the heavy drop has its limitations. It may be that new developments will eliminate the heavy drop, but not in the foreseeable future.

This article *does* attempt to point out that, for an airborne division, the heavy drop can and should replace the World War II combat glider.

May the old glider rest in peace!

**Note: The C-119 was discussed in CAPABILITIES OF THE NEW AIRBORNE DIVISION, which appeared in the October 1950 issue of this publication.

Discover Your Field Glasses!

By Maj Schiller F. Shore, Infantry

Want to increase your range of vision six times? It's easy—just check out a pair of six power field glasses.

Maybe you've already tried them and weren't impressed. They made you dizzy. Your vision was blurred. They were in your way. They seemed to be just so much excess baggage.

Excess baggage? Can you spot an enemy OP a couple of thousand yards away with the naked eye? Probably not without field glasses. Can you identify troops a mile away as friendly or enemy? Probably not without field glasses. Have you read the new FM 6-135*, which says, among other things, that *"generally anyone who sees a target and has the necessary means of communication may request artillery"?* To do that job right you need field glasses.** *Are* they excess baggage or do you fight shy of them because they're unfamiliar and no one has taken the time to teach you how to use them?

There have been innumerable battle incidents in which the lack of a good pair of field glasses was the cause of lost opportunities. There have been others when expert use of a pair of field glasses paid tremendous dividends.

Here are a dozen military uses for your field glasses:

1. Identifying troops, tanks, weapons, vehicles, and aircraft
2. Observing enemy positions
3. Observing enemy movements

*This fine new manual, ADJUSTMENT OF ARTILLERY FIRE BY THE COMBAT SOLDIER, shows how any front line soldier can be his own artillery forward observer.

**See in this issue FORWARD OBSERVATION: SIMPLIFIED by Lt. A. R. Ives.

4. Locating targets
5. Measuring angles
6. Designating targets
7. Observing and adjusting indirect fire
8. Making visual reconnaissances
9. Studying terrain
10. Comparing terrain with maps and aerial photopraphs
11. Selecting routes, positions, and river crossing sites.
12. Improving night vision

An expert can use his field glasses for all these purposes. The best field glasses, though, are of little value in the hands of a man who has not trained himself to use them properly.

You can become an expert in the use of field glasses with only a little study and practice. As in learning any other piece of equipment or weapon, you start with the nomenclature of the instrument. All the nomenclature you need to know (except for the reticle pattern, Figure 4) is external and shown in Figure 1. Study the nomenclature first.

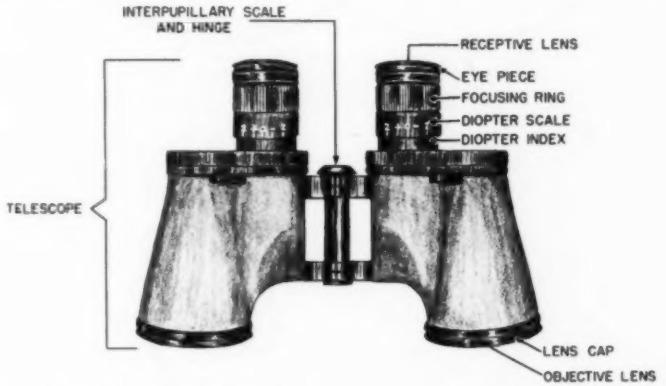

Figure 1. Binocular M13. The nomenclature shown here is all you need to know except that concerned with the reticle etched on one of the lenses.

Next, you need to adjust the glasses to your eyes. There are two things you adjust for: First, the distance between your eyes (the interpupillary distance) and, second, the focus required by your eyes. If you wear eyeglasses, better

take them off. You'll get better results with binoculars if your eyeglasses aren't in the way.

The distance between eyes varies with individuals. Army binoculars are designed to take this variation into account. The two small telescopes that make up a pair of field glasses

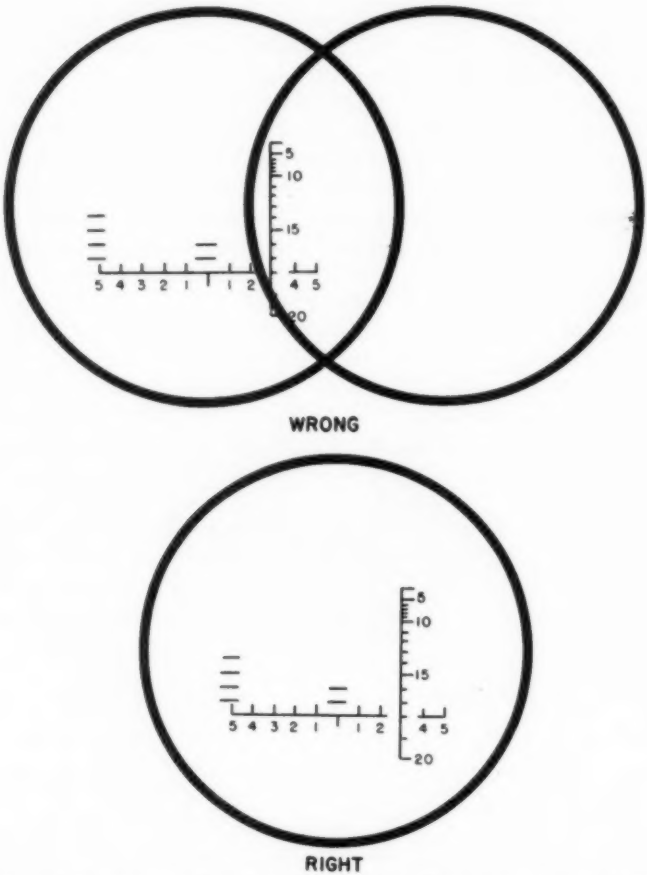

Figure 2. When adjusting for interpupillary distance, open or close the glasses at the hinge until the field of view ceases to be two overlapping circles and appears to be one sharply defined circle.

are hinged together so that the receptive lenses can be centered over the pupils of the eyes.

To make this setting, look first through the glasses at some fairly distant object. Then open or close the glasses at the hinges until the field of vision ceases to be two overlapping circles and appears as a single sharply defined circle. (See Figure 2.)

Memorize this setting as it appears on the interpupillary distance scale, or, use a china white marking pencil and draw a line through the index and the setting on the scale. This is necessary because you lose the setting each time you return the glasses to their case.

Now you're ready to adjust for focus. Each individual, and each eye of that individual, requires a different setting. First, with both eyes open, look through the glasses at some object 100 to 1,000 yards distant. Then place a hand over the front of one ocular and turn the focusing ring of the other in or out until the object is sharply defined. For finest

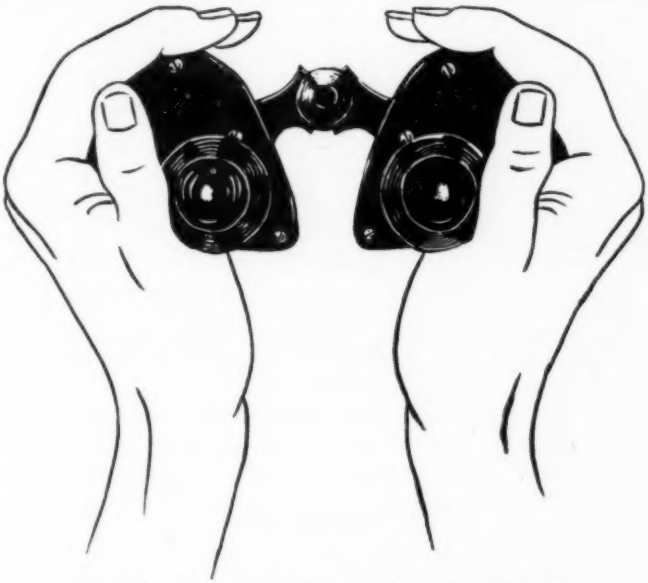

Figure 3. Hold your glasses lightly in both hands.

adjustment, pick out some small detail of the object and continue to adjust for sharpness. Now cover this ocular and repeat the process for the other one. Again, memorize or mark the setting for your eyes on the diopter scales of the eyepieces. *Rest your eyes often.*

For maximum performance from your glasses, hold them properly. Most of us mistreat both the instrument and ourselves by improper holding. Don't get a stranglehold on the glasses. Hold them *lightly* in both hands, the telescopes rest-

Figure 4. The telescopes rest on the heels of the hands; the thumbs block out light that tends to enter the sides of the eyepieces.

ing on and supported by the heels of the hand. The thumbs block out light that tends to enter between the cheeks and the eyepieces. (See Figures 3 and 4.) The eyepieces are held lightly to the eye to avoid transmission of body tremors to the instrument. Whenever possible use a rest for the elbows or the glasses. *Rest your eyes often.* DO NOT GRIP YOUR GLASSES!

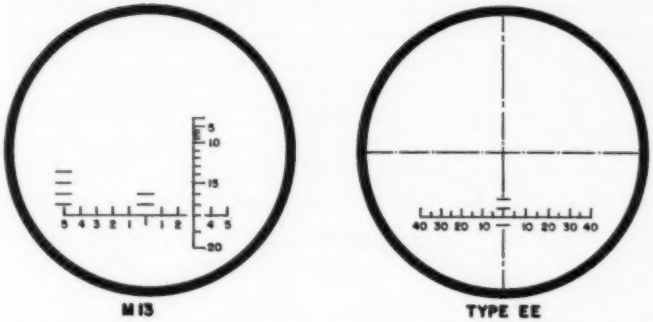

Figure 5. Reticle patterns of the Binocular, M13, and Field Glass, Type EE.

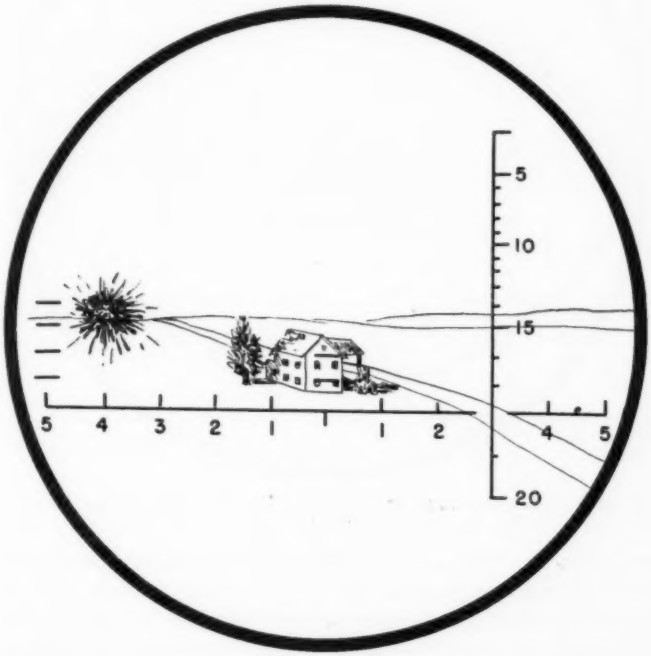

Figure 6. Using the horizontal mil scale, center the house on the zero marker. The shell burst then appears over the "4" marker indicating that the burst is 40 mils to the left of the house.

The mil scale you see when looking through military glasses is etched into only one of the lenses. This scale, called the reticle pattern, is used to assist in adjusting fire, designating targets, and measuring angles. Figure 5 shows two types of reticle patterns.

The horizontal scale on the Binocular, M13, is divided into 10 mil increments. The zero line is the short vertical line that projects below the horizontal scale between the two

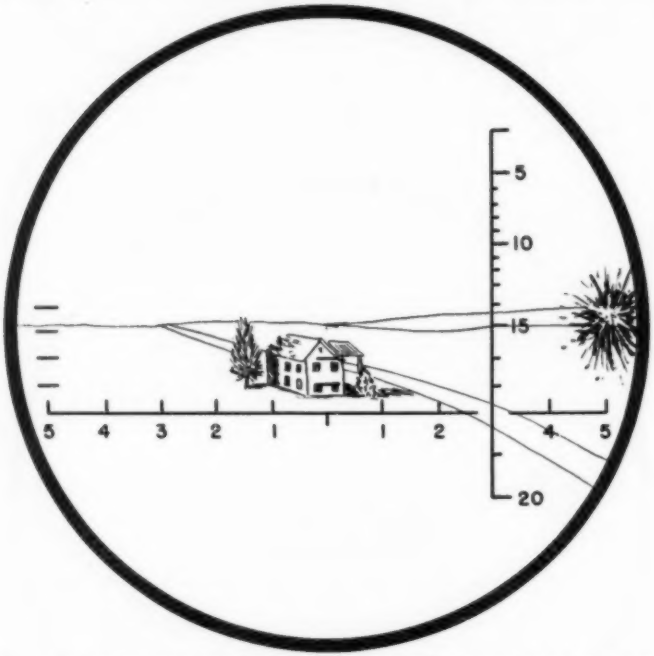

Figure 7. Measuring angular distance when the burst is to the right of the target: here the angle is 50 mils.

numerals "1." To measure the angle between two objects (such as a target and an artillery burst) center the target above the zero line. Then read the number which appears on the scale under the artillery burst. For example, in Figure 6, the angle between the house and the shell burst is 40 mils. In Figure 7 the angle is 50 mils.

You can read vertical angles, too. For quick use you have two vertical sets of mil scales. These are short unnumbered horizontal lines. One set is above the zero on the horizontal scale, the other above the left horizontal 50 mil line on the horizontal scale. The vertical scales are divided into incre-

Figure 8. Using the vertical mil scale. The base of the tree is at the second intersection above the horizontal line. This indicates the vertical angle between the house and the tree base is 10 mils.

ments of five mils each. Figure 8 shows how a vertical angle can be read. The vertical angle between the house and Point A, at the base of the tree, is 10 mils.

A third vertical scale, the range scale, is used to secure range setting on sharply defined auxiliary aiming points when the target is not clear enough for direct aiming. The target must be visible and its range known for the observer to determine these range settings. In use, the graduation

marking the known range is laid on the true target. Any sharply defined object that coincides with a graduation on the scale may then be selected as an aiming point. If, for example, there is a target along the wooded ridge line shown in Figure 9, and its range is known to be 1,000 yards, the graduation "10" on the scale is laid on the ridge line. Anyone of several aiming points will then be opposite other graduations on the scale. The skyline, for instance, crosses

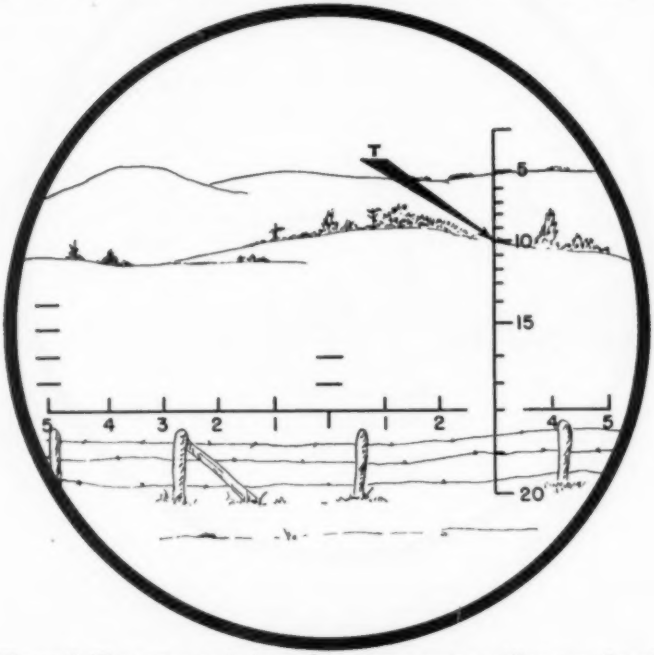

Figure 9. The range scale is used to secure range settings on sharply defined auxiliary aiming points when the target is not clearly visible.

the scale at "5." If aim is taken at the skyline with "500" set on the rear sight of the rifle or machine gun, shots will fall on the ridge line where the target is located. The middle wire of the fence crosses the scale at "19." If the wire is aimed at with "1,900" on the rifle sights, shots again will fall on the target.

The range scale may have limited use in actual practice but it's an interesting feature to know about your field glasses.

Know the mil scale and the mil relationship and you'll have little difficulty in solving fire adjustment problems such as those which appear in FORWARD OBSERVATION: SIMPLIFIED.

HELPFUL HINTS

DO

1. Clean glasses with a camel's hair brush or lens tissue—only. Keep some lens tissue in the case at all times.
2. Keep the inside of the carrying case free of sand, dust, and water.
3. Clean the carrying case and strap with saddle soap.
4. Handle carefully.
5. Keep the carrying case lid securely fastened.
6. Know the width of the field of vision of your glass in mils so that large angles may be measured rapidly without actually having to re-read the scale with each shift of the glass.
7. Use the glasses under shade whenever possible. But if you have to use them in the open, shade the lenses from the sun's rays. A lens reflection can be seen for miles.

REST YOUR EYES OFTEN.

DON'T

1. Disassemble any part of the glasses. This breaks the waterproof seal and the glasses soon become useless.
2. Use oil or other lubricant on any part of the field glass.
3. Wipe lenses with finger or cloth. A finger print may become permanently etched on the lens; cloth will scratch it.
4. Tamper with eyepiece assemblies or lens caps.

AND DON'T GRIP YOUR GLASSES.

Discover your field glasses. Learn to use them. They "see" six times farther than you do.

Captain Doughboy—Infantry-Tank Team Commander

By Lt Col George B. Pickett, Jr., Armor

Captain John K. Doughboy is suddenly awakened by his Executive Officer. "They want you at Battalion." Doughboy hurriedly dresses, stumbles along with his weapons platoon leader to the battalion CP. S-3 calls him over to the map and briefs him on the coming attack. Among other statements S-3 makes is "—and you will have the 1st Platoon of the regimental tank company attached—"

Doughboy, a product of The Infantry School, recalls what has been taught him about tanks; not just "armor protected fire power, mobility, and shock action," but the knowledge and "know-how" about tanks which will be important to him in the coming attack.

CAPABILITIES

Doughboy recalls having heard that the favorable characteristics of tanks are armor protection, firepower, mobility, and shock action. He also knows that his job is to use these capabilities to the utmost. To Doughboy, armor protection means the tank's abilty to maneuver on the battle field under small arms, automatic weapon, and shell fire. The small arms and fragments will have no effect on the armor, but will force the tank crew to "button up," which restricts their field of vision. He also knows that properly placed small arms fire can break the periscope head on the tank's vision devices, but since several replacements are carried for each periscope and can be replaced by the crew from their position inside the tank, this problem is only temporary. The armor protects the crew from all but the largest shells; however, artillery fire can set

a tank on fire or damage the suspension system enough to put the tank out of action. The Russians, Doughboy recalls, had marked success in breaking up German tank attacks in 1943-44 by using massed artillery. Yet if the Germans had possessed anywhere near equality in artillery, this would not have happened.

Doughboy knows that another capability of tanks in support of infantry is *fire power*. Not just the ability to fire a machine gun or cannon from a defiladed position, but the ability to continue fire while advancing on the enemy's position. This fire power is mobile; it can be delivered at a halt or while moving. Our present tanks are equipped with three machine guns — one co-axial with the tank cannon, one in the bow of the tank that is called a "bow gun," and an antiaircraft gun mounted on the outside of the turret. The primary armament of the tank is the cannon, either 75-mm, 76-mm, or 90-mm, depending on the model of the tank. Doughboy can expect to receive a continuous volume of machine gun fire support from the tanks in the assault to replace the supporting fires when lifted. The tank gun not only can protect the infantry from enemy tanks, but can destroy point targets such as direct fire weapons, machine guns, and emplacements. The 90-mm gun on the M26 tank is the best direct fire weapon in the infantry regiment with regard to accuracy, range, and penetration. This tank fire power can also be used from stationary positions on or near the line of departure to support the assaulting infantry, although this is usually undesirable since the shock action and fire power of the tanks is not used in the assault. All this Doughboy knows — without this knowledge he could not be an efficient infantry-tank team commander.

He knows, too, that *mobility* is an outstanding capability of the tank. The tank is not roadbound, but has considerable cross-country facility. German experience in Russia indicates that Moscow was not taken by 1 October 41 because their transport system failed; their wheeled supply and service vehicles could not move cross-country to support the tanks, *which were able to advance rapidly*. The Germans had expected to find roads for their service and

supply vehicles — they found none. This illustrates the tank's cross-country mobility. Practically speaking, a tank's mobility is determined by the width of its tracks — the wider the tracks, the more weight is distributed over the ground and the less the pressure on that ground. Obviously, the less ground pressure the better the tank can negotiate mud and soft sand.

The last inherent capability of the tank, Doughboy remembers, is *shock action,* which is the adverse psychological effect on the enemy of the bulk and fire power of the tank as it bears down on his position — a formidable picture.

FACTORS AFFECTING TANK EMPLOYMENT

But Captain Doughboy realizes very well that, in spite of all of its capabilities, the tank is not an ultimate weapon. Like any piece of machinery it is no better than the men operating it; no better than its maintenance and servicing. Doughboy remembers the instruction at Benning concerning the factors affecting tank employment. These factors receive consideration in the employment of tanks, but do not deter the tank platoon leader from taking aggressive action to accomplish the mission assigned him. The weight of the tank limits its employment over swampy or muddy terrain. When the tank is buttoned up, the crew's vision is restricted, although this difficulty can be largely be overcome by assigning each crew member a definite sector of observation and by having one tank cover the flank and rear of another. The massive size and shape of a tank, when in the open or silhouetted against the sky line, provides a relatively good target. Its size makes it difficult to operate in heavy woods or other close terrain.

Terrain and weather, Doughboy knows, are factors to be considered. Tank action is restricted by swamps, rivers, dense forests, ground heavily covered by boulders or stumps, high vegetation which limits visibility, deep, soft sand, and steep slopes. Sudden changes in the weather may hamper or halt movement of tanks. Heavy rains may leave ground too soggy to support tanks; heavy snows or sleet may make roads impassable.

The characteristic noise of the tank, Doughboy recalls, makes it difficult to move even individual tanks in the presence of the enemy without detection.

Continued operation of the tank depends upon efficient maintenance and adequate and timely resupply of fuel, lubricants, ammunition and spare parts. And since a tank is soon immobilized if it lacks this servicing, Doughboy plans to give his tank leader enough time for these jobs. He knows enough about the type of tank with which his regimental tank company is equipped to insure himself that the tanker is not trying to get out of something when he asks for this time. Such frequently used expressions as track support rollers, track tension, bogie wheel, driving sprocket, and other everyday tank terms are not foreign to Doughboy. He may not be a finished tank technician, but he knows what the score is.

He knows, for example, the fuel capacity of the tank, how many gallons it takes to go one mile, and about how long it takes to resupply it with fuel and ammunition. He appreciates the tonnages of tank gun ammunition and, if a fight is expected as soon as resupply is completed, Doughboy'll provide some infantrymen to assist in handling the heavy loads. He knows that if his men assist the tankers in resupply, it will pay off in better teamwork once the team crosses the line of departure. It's one of the small things that make for big cooperation in the infantry-tank team.

EMPLOYMENT

Captain Doughboy recalls from his Benning instruction that the infantry rifle company may fight with tank units from three sources: the regimental tank company, the division tank battalion, or corps tank units attached to his division. The infantry-tank team is formed by attaching a tank unit to an infantry unit or an infantry unit to a tank unit. Since the amount of infantry in the infantry division greatly exceeds the tank units, most of these teams are infantry-strong; yet Doughboy realizes that his company or one or two of his rifle platoons may be attached to a tank company during a fast moving attack.

Doughboy's present situation is typical; he commands a rifle company with a tank platoon attached. He is responsible for coordinating the effort of his rifle platoons and weapons platoon with the tank platoon. He achieves this coordination by organizing his team for combat, selecting the method of attack, developing his plan of attack, and by use of effective infantry-tank communications.

If the terrain over which his attack is to be made is favorable for tanks throughout his zone, he normally keeps the tank platoon intact under company control and uses it to support the entire assault echelon. If the terrain in the zone of one platoon is more favorable for tank employment, he forms a platoon team by attaching the tank platoon to a rifle platoon or attaching a rifle platoon to a tank platoon. Notice that Doughboy does not split up the tank platoon by attaching *sections* of it. Employing tanks by sections normally is used only in jungles, dense woods, fortified areas, and in built-up areas.

Doughboy now selects the method of attack. We have all seen good football teams in action. Doughboy's problem is similar to the football coach's. His team is handed the ball at the line of departure and must cross the goal line by teamwork between the members of his team. His goal is the objective and the members of his team are not guards, tackles, ends, etc., but tankers and infantrymen. The several different means which he may employ to coordinate their movment and fire power in the advance from the line of departure to the objective are called methods of attack. In general, five methods of attack are employed by the infantry-tank team:

(1) Tanks support by fire, then move forward rapidly to join the infantry for the assault. (This method is used when the objective is clearly defined and when the terrain is sufficiently open to permit tanks to fire overhead or to the flanks of the advancing infantrymen. This provides effective tank fires to cover the movement of the infantry from the line of departure to the assault position, and it assures close tank fire support at the critical time of the assault.)

(2) Tanks suport by fire, then pass through the infantry to lead the advance to the objective. (This method may be used as a variation of (1) above. After passing through the advancing infantry, tanks precede the infantry at distances varying from 50 to 300 yards, protected against local antitank weapons by their own fires, fires of the assault rifle unit, and airburst artillery fires in front of the tanks or on the objective.)

(3) Tanks support by fire alone. (This method is used when either natural or artificial obstacles prohibit the tanks from moving to the objective.)

(4) Infantry and tanks advance together. (This method is used when visibility, fields of fire, and tank movements are restricted. These conditions exist in fog, heavy rain, towns, woods, and at night. When this method is employed advantage is not being taken of the tank's mobility. Fire directed at the tanks may harass the infantry.)

(5) Infantry and tanks converge on the objective from different directions. (This method is used when there are at least two approaches to the objective, one favoring an infantry advance, another passable for tanks. This method obviously requires close coordination between the tanks and infantry.)

Doughboy knows that communication facilities are necessary for effective coordination once the team crosses the line of departure. He must have means available to control movement and direct fire, and he realizes that target designation by infantrymen to tanks and control of the tanks' fire is only as effective as this communication. Doughboy has the SCR-300 to net with the AN/VRC-3 in the tanks. In addition, each tank has an external telephone for infantrymen to use in talking to the tank crew. Colored smoke and tracers are also effective means for target designation. But nothing surpasses direct contact between the rifle squad leader and the tank commander on the battlefield.

Doughboy further coordinates the elements of the team by formulating his plan of attack, containing:

a. Task formations
b. Method of attack

c. Attack position
d. Line of departure
e. Time of attack
f. Routes for infantry and tanks
g. Objectives
h. Plan for reorganization on the objective

CONDUCT OF THE ATTACK

At 010645 December —, Captain Doughboy's infantry-tank team launches its attack. The tank platoon is equipped with M-26 tanks. Almost immediately an Aggressor machine gun opens up on the right assault rifle platoon. At once a blue smoke grenade is fired by a rifleman to indicate the target. Tank number one is designated by the platoon leader to knock out the machine gun. The commander of tank number one selects the proper type of ammunition. In this case it's HE (high explosive) with fuze quick. (If he used delay fuze, he would get a ricochet and an air burst.) The tank commander adjusts, using the bracketing method and destroys the Aggressor machine gun with the third round.

The team continues to advance until an Aggressor tank exposes itself momentarily to fire on one of Doughboy's tanks. Tank number two knocks it out by using an APC (armor piercing capped) round. APC for the 90-mm gun will penetrate 5.2 inches of armor that is sloped at 30°. It will penetrate about a foot of reinforced concrete. If the Aggressor tank had been a heavy instead of a medium, the gunner would have used a round of HVAP (high velocity armor piercing) that would penetrate 7.8 inches of armor at 30°. Doughboy knows also that the 90-mm tank gun has a WP (white phosporus) smoke round.

As the advance continues, a group of Aggressor soldiers attempt to run back from one group of foxholes to another. Tank number four spots the move and cuts them down with fire from the co-axial machine gun. Doughboy remembers learning at Benning that the tank machine guns are very effective weapons to saturate an area and also to destroy personnel in the open.

The team arrives in the assault position, very little time is lost. The tank platoon displaces forward rapidly to join the right assault platoon. Doughboy has the tanks and infantry advancing in the assault together. The tanks are spraying the enemy position with a continuous volume of fire from their co-axial and bow guns. The infantry uses assault fire and the team advances through the position. One rifleman walks along closely behind each tank to operate the external tank telephone. An Aggressor attempts to fire a rocket launcher at a tank, but is killed first by a rifleman. Throughout the attack, Doughboy makes certain that the tanks and infantry are employed in mutual support.

SUMMARY

No one arm wins battles. Success is produced by proper coordination of the combat arms into a combined arms team. To Captain Doughboy and the men of his unit, the Infantry-Tank team, properly supported by artillery and heavy weapons with cooperating air, is the basic fighting combination.

New Infantry Training Films

By Capt Frank F. Rathbun, Infantry

Infantry instructors are often faced with the difficulty of getting the latest information on new training films. Department of the Army catalogs necessarily trail some months behind film production and distribution. And some instructors, especially those in the Civilian Components, are so far off the beaten track that they never receive news of the latest films at all.

To remedy the situation somewhat, we are listing here all the Infantry films that have been made and distributed to Signal Corps libraries since 1 June 1949.

We have also prepared a synopsis of each film. This will enable you to become well enough acquainted with each film's instructional content to decide if it is the film you want to order or look at.

Civilian component instructors can order training films from central film libraries in each Army headquarters or from sub-libraries in their military district headquarters. Films cannot be obtained from other sub-libraries without specific permission of Army headquarters.

Training films are now cataloged in SR 110-1-1, INDEX OF ARMY MOTION PICTURES AND FILM STRIPS, which replaced old FM 21-7 on 5 January 1950. This publication contains synopses of all films released up to August 1949. Most Army areas keep this SR up to date with semi-annual supplements that contain new film and film strip releases.

SR 110-1-1 does not, of course, list classified films. A complete list of classified films is available at all Signal Corps film libraries.

No.	*Title*	*Date Distributed*
TF 7-1504	THE RIFLE SQUAD IN ATTACK	Oct 1949
TF 7-1505	THE RIFLE PLATOON IN ATTACK	Dec 1949
TF 7-1507	THE RIFLE PLATOON IN ATTACK OF FORTIFIED POSITIONS	Sep 1950
TF 7-1510	TROOP MOVEMENT BY AIR	Mar 1949
TF 7-1521	THE RIFLE COMPANY IN ATTACK	May 1950
TF 7-1522	COUNTERFIRE	Apr 1950
TF 7-1540	SMALL INFANTRY-TANK TEAM—PART I, CHARACTERISTICS	Aug 1949
TF 7-1541	SMALL INFANTRY-TANK TEAM—PART II, ATTACK MISSION	Aug 1949
TF 7-1542	THE HEAVY WEAPONS COMPANY IN ATTACK	Jun 1950
TF 7-1681	INFANTRY WEAPONS AGAINST TANKS	Oct 1950
TF 31-1525	AERIAL DELIVERY CONTAINERS—PART I, LOADING AND DISPATCHING	Jun 1949
TF 31-1526	AERIAL DELIVERY CONTAINERS—PART II, PARACHUTE ARTILLERY	Jun 1949

Synopses of the new films follow:

THE RIFLE SQUAD IN ATTACK
(TF 7-1504)

This training film tells the story of a rifle squad in an attack. Its opening scenes picture the squad in an assembly area while the men are preparing for the attack. The last scenes show the same squad after capture of its objective, beginning to reorganize. The reasons for that success — the careful preparations, the planning, the techniques of leadership within the squad, the application in the attack of principles taught to the individual soldier — are all brought out.

The film begins by emphasizing, through the actions of squad members in the assembly area, the importance of checking equipment, supplies, and personnel before the squad moves up to engage the enemy. It shows the squad leader receiving the platoon attack order from his platoon leader. It then follows the squad leader as he makes a hasty reconnaissance, plans his attack, and issues his order to the men of his squad. The movement of the men from the assembly area to an attack position is depicted, including an

explanation of the formation used and the characteristics and purpose of the attack position. The next scenes show the squad crossing the line of departure and fighting its way to the assault position. Realistic combat scenes show the squad as it makes its final assault, employing assault fire to capture and destroy the enemy on the objective.

THE RIFLE PLATOON IN ATTACK (TF 7-1505)

This is the picture of a rifle platoon in a coordinated attack of an enemy-held ridge. The opening scenes show the platoon moving up to an assembly area. The action and dialogue indicate the platoon will shortly take part in an attack. In logical step-by-step process, the platoon leader and members of his platoon are followed as they receive the order to attack, make preparations, conduct the attack, and reorganize on the objective.

The story emphasizes the importance of properly preparing a small unit for an attack. Lieutenant Reed, the platoon leader, is shown as he follows the correct troop leading procedure and makes his estimate of the situation. The platoon and squad orders are issued and the platoon launches its attack. Realistic shots and fast action show the platoon deploying and launching its assault as supporting fires lift. The value of employing intense fire in the assault is illustrated as the platoon moves on the objective. The film then follows Lieutenant Reed in the reorganization and his preparations to continue the attack.

THE RIFLE PLATOON IN ATTACK OF FORTIFIED POSITIONS (TF 7-1507)

Here are depicted the problems involved in attacking a fortified position. The film brings out the essentials of a plan for coordinated attack, and demonstrates the execution of the attack.

The introductory sequence shows that fortifications and fortified positions have been in existence and have been attacked throughout the history of military operations. The

factors of defense that are incorporated in the construction of fortified positions are shown. This includes utilization of the terrain, coordination of fires, use of camouflage and dummy positions, communication systems, antitank defense, and provisions for counterattack. The details of construction of one of the typical pillboxes to be found in such positions are illustrated.

The specially organized unit which is to close with and neutralize the pillbox is shown and explained. Its equipment and the duties of the individual members are pointed out. A tactical situation is introduced and the essentials of planning for an attack are demonstrated by following the troop leading procedure of the platoon leader. This troop leading is carried down to the assault and base of fire elements. This part of the film emphasizes the preparations necessary for a successful attack.

The final sequence portrays the execution of the attack as planned during the earlier portion of the film, including the employment of the platoon, the use of supporting weapons, and the importance of close coordination throughout the attack.

TROOP MOVEMENT BY AIR (TF 7-1510)

The instructional material in this film is presented by following a platoon through phases of instruction in air transportability. A pictorial history of airborne and air-transported operations shows how cargo aircraft were employed during World War II. The men of the platoon are then familiarized with the aircraft they may be expected to use. They receive training in flight safety, computation of loads, special tiedown devices, and loading and lashing heavy equipment. Their instruction ends with a tactical problem, during which they apply the techniques and methods of air transportability that they have learned.

Most general purpose Field Forces vehicles are shown being loaded and lashed during this film. These include the ¼-ton truck and trailer, the ¾-ton truck, the 2½-ton truck, the 105-mm howitzer, M2, and combinations of vehicular and personnel loads.

The closing sequence of the film stresses the future use of cargo aircraft in the movement of troops and equipment by air and the responsibility of the individual soldier in an air move.

THE RIFLE COMPANY IN ATTACK
(TF 7-1521)

This training film portrays the activities of an infantry rifle company before and during one day of combat. The combat situation begins as Captain Jones, commander of Company L, receives the battalion attack order and readies his company to attack a strongly organized enemy position. The company, with one tank platoon attached and with strong supporting fire, advances, captures its initial objective, continues the attack to the next objective, repels a counterattack, and reorganizes for further action.

Throughout the preparation for and conduct of the attack, the film emphasizes how supporting units assist the company. It stresses the actions of the company commander and his subordinate leaders as they coordinate and control the elements of the fighting team to obtain the maximum offensive power and shock action.

COUNTERFIRE
(TF 7-1522)

Counterfire opens with a soldier taking cover during a heavy artillery barrage, and the narrator asks, "What can you, a front line soldier, do in a situation like this?"

The soldier in the film takes a compass reading to an enemy gun position. The film follows his information back through his platoon, company, and battalion to the regimental counterfire officer.

The counterfire officer is shown as he receives this information. He also receives information from aerial observation, photo interpretation, prisoner of war interrogation, sound locating teams, and artillery forward observers.

The film explains briefly how this information, when plotted on the shellrep and counterfire map, builds up into a reliable indication of enemy positions. When the location

of the enemy position is finally narrowed down, the artillery liaison officer calls for a fire mission to neutralize it.

A summary repeats the sources of counterfire information and stresses the importance of information from the front line soldier.

SMALL INFANTRY-TANK TEAM — PART I CHARACTERISTICS (TF 7-1540)

The film opens with a discussion of the organization of the tank platoon. The next sequence shows the power and capabilities of the tank, followed by portrayal of its limitations and weaknesses. Fire power of the tank is illustrated by scenes showing the two caliber .30 machine guns, the caliber .50 machine gun on the turret, and the 90-mm gun. The weight and volume of ammunition, fuel, and supplies for the tanks are shown and described.

A brief animation sequence gives the composition of the small infantry-tank team, stressing the importance of mutual support. Tank elements of a team destroy machine guns hazardous to the riflemen, and the riflemen of the team eliminate an antitank gun to which the tanks are vulnerable.

Communications between members of the team are shown: radio facilities, external tank interphone, arm-and-hand signals, flags, sound, light, colored smoke grenades, and messengers.

The contributions of the tanks to the success of the team are next shown: tanks destroy enemy automatic weapons; neutralize enemy positions; make paths through antipersonnel mines and barbed wire; and provide antitank defense.

The contributions of the riflemen follow: riflemen protect tanks from antitank weapons, especially short range individual weapons and long range antitank weapons; riflemen help by maneuver, patrol, reconnaissance, or by using infantry supporting weapons, such as mortars and artillery; riflemen provide close-in protection for tanks; they find

paths through or around antitank mines or terrain obstacles; they mop up and consolidate objectives.

The conclusion emphasizes that the infantry-tank team is strong because the strengths of each are combined, and that separate weaknesses are reduced by mutual support.

SMALL INFANTRY-TANK TEAM — PART II ATTACK MISSION (TF 7-1541)

The film opens with a brief summary of the principles of infantry and tanks fighting together as introduced in Part I, "Small Infantry-Tank Team — Characteristics."

Following the summary, the film shows the various methods riflemen use on the battlefield to designate targets to tanks. Methods shown include tracers, the tank's external interphone, rifle smoke grenades, arm-and-hand signals, and radio.

The film follows a rifle platoon and a tank platoon in a typical attack mission. The team is in the attack position with the rifle company commander making final coordination with the two platoon leaders. First enemy resistance encountered is a machine gun outpost. Our riflemen return the enemy's fire, designating the enemy position to the tanks. The tanks destroy the machine gun.

That tanks are not invulnerable, is demonstrated when the first tank section is exposed to the main enemy position and one of the tanks is destroyed by an enemy antitank gun.

Quick battle planning by the two platoon leaders is featured as the team prepares to assault the objective. The tanks deliver direct fire on the objective, moving from one firing position to another to avoid presenting favorable targets for the enemy. Assistance of supporting weapons, such as artillery and mortars, is also shown.

While tanks, mortars, and artillery pour fire into the objective, the rifle platoon moves through a wooded draw to an assault position near the objective. The rifle platoon leader calls for one tank section to join him there for a combined assault while the other tank section continues its overhead and flanking fires on the objective.

As the riflemen and tanks launch their combined assault, the powerful effect of this team's firepower becomes apparent. Riflemen and tanks, moving generally in line during the assault, deliver a heavy volume of rifle and machine gun fire on the enemy-held hill. The film illustrates how each member of the team, protecting the other, makes possible a quicker and less costly assault. Value of the supporting fires from the tanks firing overhead is also shown.

A brief animation sequence illustrates the manner in which this team reorganizes and disposes its components in preparation to repel an enemy counterattack.

THE HEAVY WEAPONS COMPANY IN ATTACK (TF 7-1542)

While waiting in an assembly area for his first attack mission, a heavy weapons company commander recalls the months of training that have welded his men into a fighting unit. During this sequence, the kind and number of weapons in the company are established and their use explained. The film then returns to the company assembly area just as the company commander is called to the battalion command post to receive the warning order for an attack. After receiving it, he makes his preliminary reconnaissance, aided by his reconnaissance detail.

When he has received the reports of the reconnaissance detail, he prepares his recommendations for the employment of the company and gives them to the battalion commander. The battalion commander approves these recommendations and issues his attack order. Company, platoon, and section leaders conduct their own reconnaissance and issue their orders. Prior to H-hour, weapons of the heavy weapons company are moved to firing positions that were selected during reconnaissance.

Preparatory fires are delivered from H-minus 3 minutes until H-hour. These fires are coordinated with the supporting fires of other weapons and are continued until the rifle companies request that they be lifted or shifted.

During the attack, the heavy weapons fire on and destroy targets of opportunity that appear in the battalion zone.

Forward displacement is made as the assault elements advance. When the objectives have been captured, the heavy weapons company supports the reorganization of the rifle companies. It accomplishes its own reorganization during lulls in firing.

INFANTRY WEAPONS AGAINST TANKS (TF 7-1681)

The opening scenes of this training film arouse interest in the subject by dramatizing the vast inequality that exists between the lone rifleman in his foxhole and the thick-skinned, heavily armored, modern tank. It then goes on to prove, however, that the rifleman is neither alone nor helpless. He has many weapons at his disposal and on the line with him which, when properly used, are the equal of any tank now made.

Characteristics of tanks — their armor and armament, their strong points and weak points — are vividly shown by animated drawings. The animation reveals where dead spaces can be found in the tank's fields of fire and vision, and illustrates how the tank hunter can take advantage of them.

The film also sketches briefly the characteristics of armored attack with infantry. It shows the use of other weapons, in addition to the antitank weapons, in separating the infantry from the tanks and in making the tanks button up.

Infantry weapons demonstrated against attacking tanks are the rifle grenade, the hand grenade, the rocket launcher, the recoilless rifle, mines, and various tank hunting expedients. The film does not teach the details of how to fire the weapons or how to construct the expedients, but portrays the characteristics of each one and how it can best be used.

AERIAL DELIVERY CONTAINERS PART I — LOADING AND DISPATCHING (TF 31-1525)

The opening sequence of this film covers the primary types of aerial supply: powered aircraft, glider, parachute,

and free drop. It establishes parachute supply as the third most effective form of aerial supply.

Covered briefly are individual containers, which are attached to the main lift of the parachute harness and which provide a means for parachute troops to deliver light and medium loads.

The simplest standard aerial delivery containers and the smallest aircraft involved in parachute supply missions are considered first. As the film continues it shows progressively more complicated containers and larger aircraft.

The technique of packing each of the standard A-series containers is demonstrated. The containers, in turn, are dispatched first as door loads from the C-82 aircraft, then from release shackles under the wings of a liaison type aircraft, from the monorail aerial delivery dispatching system of the C-82 aircraft, and from the monorail system of the C-97 aircraft.

The end of the film demonstrates the technique used in delivery of completely assembled items of equipment, utilizing parachutes up to 96 feet in diameter.

AERIAL DELIVERY CONTAINERS PART II — PARACHUTE ARTILLERY (TF 31-1526)

The film begins with the briefing that a parachute artillery howitzer section receives before a tactical mission.

The section moves from the briefing room to an outside area, where the 75-mm pack howitzer, M1A1, mounted on the carriage, M8, is seen with nine M-series containers.

The section disassembles and packs the howitzer into seven of the containers. Eighteen rounds of ammunition are packed in the remaining two. The M-series containers, plus six A-5 containers packed with additional ammunition, are attached to the monorail aerial delivery dispatching system in a C-82 aircraft.

During flight, the techniques used in dispatching the load and the command sequence for jumping personnel are covered.

After the drop, the 10-man howitzer section assembles the piece and the paracaisson with 18 rounds of ammunition on the drop zone.

In conclusion, the artillery piece is hand-towed into position, aiming stakes are aligned, and the piece is fired.

Look for RIFLE PLATOON IN A NIGHT ATTACK, by Capt Charles K. Blum, in the April issue of the QUARTERLY. It's a useful article on planning and executing a platoon attack at night.

Forward Observation: Simplified

By 1st Lt A. R. Ives, Infantry

Can't advance because you need artillery fire?

Can't get artillery fire because you have no forward observer?

That predicament need confront the front-line infantryman no longer. Now, any soldier who

Can talk on a field telephone or radio

Can read a lensatic compass

Is familiar with the mil relation*

can be his own forward observer in requesting and adjusting indirect fire. This is made possible by the Army's adoption of the *target-grid* method of adjusting indirect fire.

No longer does the forward observer need to be a mathematician with a multitude of formulas at his fingertips. And, even more important, no longer need he worry about his location with respect to the gun-target line.

This new *target-grid* method of fire control sounds foolproof, and it is as nearly so as any method yet developed. Target-grid control, now used by all the armed forces, has greatly simplified the job of the forward observer. It has eased, too, the work of the gunners at the firing positions. Much of the firing computations, formerly a part of the gunners' job, are now done at the fire direction center (FDC).

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*A mil is an angle (1/6400 of a circle) which subtends a width of one yard at a distance of one thousand yards; two mils subtend a width of two yards, etc. At 2,000 yards, one mil subtends a width of two yards, 2 mils - 4 yards, etc. From the above examples, a formula can be derived: Width subtended (in yards)/Range (in thousands of yards) $\times$ mils $= 1$; or $\frac{W}{Rm} = 1$. This is commonly known as the WORM formula. In this equation, if the value of two of the elements are known and substituted for their equivalent letters, the value of the third can be found.

The fire direction center is the "brain" controlling indirect fire and a plotting board or firing chart is its memory and reasoning equipment.

Actually the entire indirect firing unit can be compared to a living organism. The forward observation team is the "eyes"; the fire direction center, the "brain"; and the firing pieces, the "muscles".

Since you, as a front-line infantryman may, at times, become the "eyes", this article is concerned mainly with the forward observation group and its use of the target-grid method of fire control.

The Armed Forces have standardized the terminology used by forward observers. As a result, any forward observer for one type of weapon can call for and adjust the fire of any other weapon. For instance, an 81-mm mortar platoon observer not only can direct the fire of his platoon, but also the fire of any other indirect fire weapons, *including naval guns*. Furthermore, an observer can get this fire whether the FDC knows his location or not.

To initiate fire, send an *initial fire request* to the fire direction center. Note that you send a *request*, not a command. It is a request since the fire direction center has the option of firing missions in the sequence of their urgency. The FDC is not required to deliver your fire unless your request is more important than any other fire missions they might have on hand from other observers.

You request the fire mission and make subsequent corrections—the FDC formulates the *fire command* and transmits it to the firing unit.

An initial fire request may contain as many as ten elements. An element is included only if it is needed. You need not be familiar with all ten of the elements but, if you've memorized the list, it will serve as a check and prevent possible omission of an important element. The sequence that follows is the sequence in which the FDC uses each element in its calculations:

1. Identification of observer.
2. Warning order.

3. *Azimuth from observer to target, in mils.*
4. *Location of target.*
5. *Nature of target.*
6. Classification of fire.
7. Type of adjustment.
8. Type of ammunition.
9. Fuze action.
10. *Control.*

Only four of the above elements are needed by the fire direction center in order to fire a mission. They are numbers 3, 4, 5, and 10.

3. Azimuth from observer to target.
4. Location of target.
5. Nature of target.
10. Control.

Here's how you determine and report these essential elements:

Azimuth from observer to target is determined by reading the azimuth from your position to the target you want to engage. Read and send this azimuth to the FDC in *mils.* For example: You read and report: AZIMUTH 3760.

The location of the target may be designated in several ways. You may check your map, locate the target by grid coordinates and report: COORDINATES 65728611. Or, again using the map, you may give a geographical location such as FROM ROAD JUNCTION 382, WEST 200 SOUTH 400.

Lacking a map, a forward observer may request a *marking round* to pin-point the target with respect to the observed burst. An example of this form of target location in the fire request is: MARK CENTER OF SECTOR.

Another, and perhaps the most commonly used method to designate target location is by a shift from a known point, such as a reference or base point. The origin of shift is a point whose chart location is known to both the FDC and to yourself.

Measure the angular distance between the reference point and the target. (Read the mil difference between the two points on your binocular scale.) Estimating the

distance to the reference point, use the mil relation to determine the distance between the reference point and the OP-target line. (See Figure 1.) This gives the deviation correction in yards.

Imagining a perpendicular line from the reference point to the OP-target line, visualize the point of intersection of the perpendicular and the OP-target line. Then estimate the distance from this intersection to the target. (See Figure 1.) You have the range correction and you can initiate the fire request. The location element may sound like this: FROM REFERENCE POINT, RIGHT 150, ADD 200.

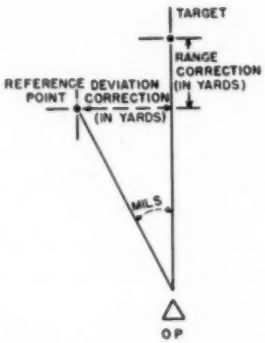


Figure 1. Locating a target with respect to a reference point known to both the observer and the fire direction center.

The nature of the target is the next element a forward observer considers. Describe the target briefly, but in enough detail so that the FDC can determine its importance. For example: ENEMY STRONG POINT, ESTIMATE PLATOON SIZE.*

Control, the fourth essential element of the fire request, is designated by one of the following methods: WILL ADJUST, which indicates that you can, and will adjust the

*At this point, if the observer is adjusting naval fire, one more element is required. This is classification of fire. Under this heading, the observer informs the FDC of the proximity of the target to friendly troops. He reports either CLOSE or DEEP, depending on whether the target is within or more than 600 yards from friendly troops.

fire; FIRE FOR EFFECT, which, when transmitted as part of the initial fire request, means that you consider the location given for the target is sufficiently accurate to obtain effective fire; AT MY COMMAND, when you want rounds to be fired at specific times as you call for them; and CANNOT OBSERVE, when you are unable to adjust the fire but have reason to believe that a target exists at the given location and that it is of sufficient importance to justify firing upon it without adjustment.

After sending your initial fire request, this, roughly, is what happens: The FDC computes the data and transmits a *fire command* to the weapon positions. Normally a single weapon fires for adjustment. You sense each round with respect to the *observer-target line.* Using the mil relation, convert the deviation error into yards. You also determine the range change necessary to place the next burst in the desired location. An example of one of these corrections is: LEFT 40, DROP 200.

A forward observer may use either one of two general types of adjustment of indirect fire.

The creeping method is used when the target is too close to friendly troops to allow any rounds to land short of the target. Using this method, all rounds should burst beyond or on the target. By successively shortening the range, a target hit may be achieved without endangering friendly troops.

The bracketing method is more frequently used. A target is bracketed for range when one round bursts between the observer and the target and one round bursts beyond the target. Establish an initial bracket of the target and, requesting successive range changes, place bursts at the center of each new bracket. Eventually, you will enclose the target in a range bracket suitable for destructive fire by the entire firing unit.

During this adjustment, you are concerned only with the location of each burst with respect to the *observer-target line.* Don't bother yourself in the least about the location of the gun-target line.

Read the deviation in mils between the burst and the target, convert this deviation to yards, and then make

the necessary range change to split the bracket formed by the last burst beyond the target and the last burst short of the target.

Sometimes when the burst is off the observer-target line, you can't determine whether the burst is beyond or short of the target. When this occurs, make a deviation correction only and request another round at the same range. Such a request might sound like this: LEFT 20, REPEAT RANGE. By observing a burst on the observer-target line, it is always possible to get a positive range sensing. That is, you can be certain whether the round is short of or beyond the target.

The range element in a correction is always the last one given except when there is a change in the *control* element. Such a change occurs when the final bracket has been established. Then you will request something like this: LEFT 10, DROP 50, FIRE FOR EFFECT.

After fire for effect has been delivered, determine whether the fire has been effective. If not, make a further deviation and range correction to move the center of the massed bursts to the target. Terminate the correction with: REPEAT FIRE FOR EFFECT. If the fire is then effective, report the results of the mission to the FDC and whether or not additional fire is required at the time.

The foregoing is a bare minimum of the requirements for adjusting indirect fire. A well-trained forward observer would be familiar with a much more detailed procedure, but you *can* get along with these essentials.

The following illustrated firing problem takes the forward observer from the initial fire request through to the final request for fire for effect.

Assume that you locate to your immediate front a house that you know is used by the enemy as an observation post. (See Figure 2.) You have wire communication with a 4.2-inch mortar platoon. You have already adjusted the platoon on a base point, a water tower, which you estimate to be 300 yards beyond the new target. Estimated range to the base point is 1500 yards. Your binoculars show the deviation between the target and the base point to be 50 mils.

Substituting in the formula, W=RM, you have:

$W = 1.5 \times 50 = 75$ yards, the deviation correction.

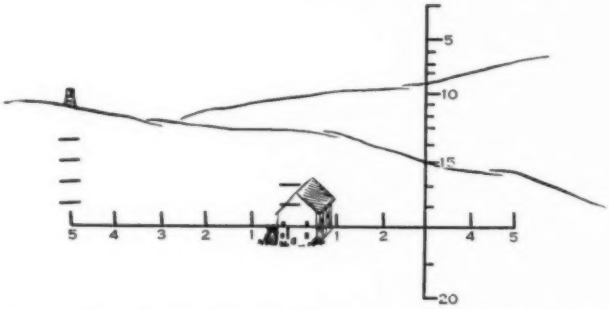


Figure 2. The observer locates his target (the house) with respect to a reference point (the water tower). The house appears to be 50 mils right and 300 yards short of the water tower.

The azimuth reading from your position to the target is 1980 mils. Your initial fire request then is:

OP NUMBER 1
FIRE MISSION
AZIMUTH 1980
FROM BASE POINT, RIGHT 75, DROP 300
ENEMY OCCUPIED HOUSE
WILL ADJUST

Back at the FDC, the firing data is computed on the plotting board and the fire command is sent to the mortar platoon. One mortar fires the first round for adjustment.

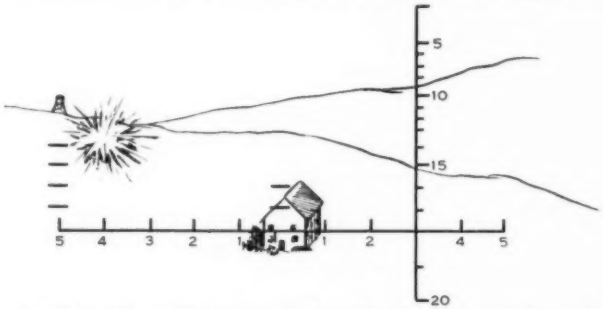


Figure 3. The first adjusting round is 40 mils left and beyond the target.

You pick up the burst in your binoculars. (See Figure 3.) With your deviation, which appears to be 40 mils between the burst and the target, and your estimated observer-target range, 1200 yards, you make your calculations for your correction:

$W = 1.2 \times 40 = 48$ yards (you'll report this as 50 yards, since you take the nearest five yards) *

You make a large enough range change to assure yourself of a bracket. In this case it appears that a change of 400 yards in range will guarantee a bracket. Your subsequent correction then is:

RIGHT 50
DROP 400

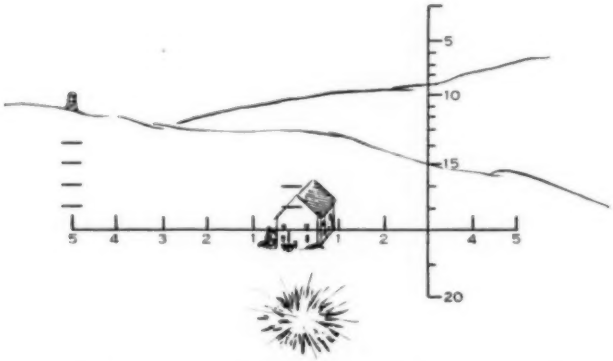


Figure 4. The second adjusting round is on the observer-target line and short of the target.

The next round is fired and you observe the burst short of the target. (See Figure 4.) It's apparent that you've obtained a 400 yard bracket. Split the bracket. No deviation correction is necessary since the burst was on the observer-target line. Your correction to the FDC will be:

ADD 200

*To be technically accurate, the range now used in the WORM formula should be the observer-burst range. The procedure followed, however, is to use the observer-target range which is sufficiently accurate. This also facilitates computation because the O-T range remains constant.

Although the burst appears short of the target, (See Figure 5) you still have a 200 yard bracket between the first and the last rounds. This one is a little off the ob-

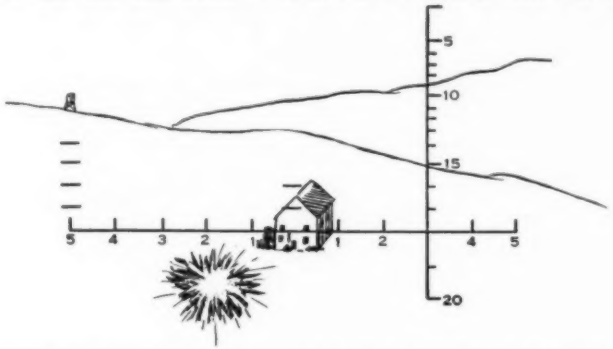


Figure 5. The third adjusting round is 20 mils left and short of the target.

server-target line—20 mils off. You calculate the deflection correction: W = RM = 1.2 × 20 = 24 yards (which you'll report as 25 yards). Then you report to the FDC:

RIGHT 25
ADD 100

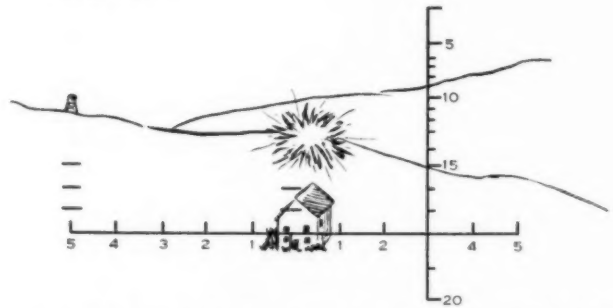


Figure 6. The fourth adjusting round is on the observer-target line and beyond the target.

Your next round bursts over and on line. (See Figure 6.) Splitting your 100 yard bracket, you report:

DROP 50

The following round arrives off-line to the right, but it is impossible to determine whether it is short of or beyond the target. (See Figure 7.) In this case you make

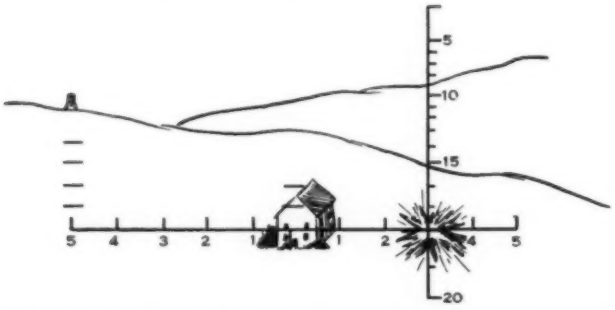


Figure 7. The fifth adjusting round is 30 mils right of the target, but it cannot be ascertained whether it is short of or beyond the target.

only a deviation correction. Since the burst appears 30 mils off line, your calculations show:

$W = RM = 1.2 \times 30 = 36$ yards (to be reported as 35 yards).

Your subsequent correction to the FDC is:

LEFT 35
REPEAT RANGE

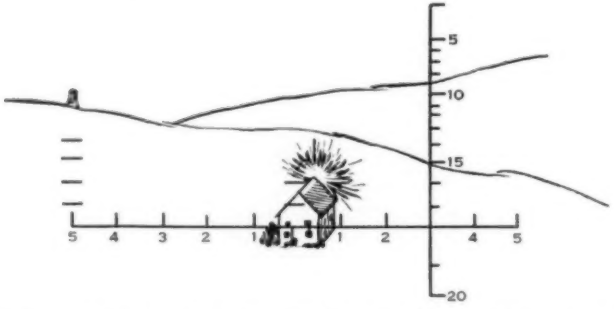


Figure 8. The sixth adjusting round is on the observer-target line and beyond the target. This round is close enough so that with the subsequent correction, the forward observer can call for FIRE FOR EFFECT.

This time your round arrives on line but slightly beyond the target. (See Figure 8.) Splitting your last bracket, which was 50 yards, you report:

DROP 25
FIRE FOR EFFECT

When the FDC receives this correction, all four mortars are fired in an attempt to neutralize the target. If the fire is effective, you will inform the FDC of that fact. If the platoon's fire has been ineffective, send a correction to move the entire group of bursts onto the target and request:

REPEAT FIRE FOR EFFECT

Getting artillery fire on a troublesome target can be as simple as this. Communication between yourself and the FDC can be very informal, so informal that the FDC can talk an untrained forward observer through any fire mission that might arise.

This simplified method of forward observation is made possible by reporting all deviation corrections as they appear with respect to the observer-target line. The distance between the observer and the gun-target line is taken into account by the FDC when it makes its calculations. This allows the observer to do an effective job with only the simplest mathematical calculations.

Any capable soldier can now be trained to act as a forward observer in requesting and adjusting indirect fire. It's no longer a mysterious affair carried on by highly-trained artillerymen.

You can do it!

Firepower Today

By Capt V. L. Antonioli, Infantry

Editor's Note: The opinions expressed in this article are those of the writer and do not necessarily reflect the thought of The Infantry School.

In any discussion involving a comparison of armies, past and present, United States and foreign, the subject of firepower sooner or later presents itself. How did *this* army rate with *that* army in the amount of lead and steel and explosives it could throw at the enemy? Who could deliver fire fastest, deliver the most, and keep it up longest?

We face the prospect of being outnumbered in future wars. It follows that we may not always be able to get to the battlefield's critical point "fustest, with the mostest" men. How, then, are we to decide battles in our favor?

We've only one choice—our "mostest" must be one of firepower rather than manpower. In combat, our army's first objective, from the rifle squad on up, is to gain fire superiority over the enemy. If we don't have many men to man many weapons, then the fewer men available to us must have better rifles, and mortars, and artillery—and these weapons must be better served and better controlled to achieve a firepower superior to that of the enemy.

What do we mean by firepower? Is it simply rate of fire; is it a question of accuracy, killing power, range, or target area that the weapon can cover? Or is it a combination of these factors?

If we take two weapons—each shooting the same size bullet, at the same ranges and with the same velocities, then the one with the greater sustained rate of fire certainly has the greater firepower.

Take the .30 caliber machine gun and the M1 rifle. Both weapons fire the same ammunition about the same distances. But the machine gun can sustain a 125 round

per minute rate of fire—the M1, only 16. Obviously the machine gun delivers greater firepower.

But now compare other small arms with these two weapons? Take the M-2 automatic carbine. It can sustain a rate of fire higher than that of the M1 Rifle, but it's far less accurate than the rifle and is limited to ranges under 300 yards. Its bullet is lighter than the M1's and doesn't pack the penetrating power of the rifle bullet. For close in fighting the carbine is a better weapon than the rifle, but does it actually have more firepower?

Consider the machine gun. It fires automatically but at a much slower cyclic rate than the carbine. Its effective range is only 100 yards as compared to the carbine's 300 yards. Although the velocity of its bullet is considerably less, it is so large and so heavy that its effectiveness against personnel (within its effective range) is greater than that of the carbine bullet. Which weapon, then, has the greater firepower?

It is evident that even in the field of small arms it is difficult to compare the firepower of the different weapons.

Now, suppose our discussion concerns the relative firepower of two different units—one foreign, the other American. Give one superiority in small arms firepower—the other superiority in mortars, artillery, or tanks. Which, then, has the greater over-all firepower?

There is no end of complications to the problem of determining firepower.

Numerous methods and formulas have been tried. One ordnance officer theorized that firepower was actually a form of power and computed the horsepower developed in firing various weapons. He used the horsepower formula of:

$$HP = \frac{W \times V^2 \times R}{146{,}876{,}400{,}000}$$

R = Rate of fire (rounds per minute)

V = Velocity of projectile (feet per second)

W = Weight of projectile (grains)

Actually, the ratio of the comparative values which he computed for various weapons was not too far from what might be considered reasonable figures.

However, what we are trying to evaluate or express when we speak of firepower is "destructive ability", whether it be destruction of personnel or material. Just as a general rule—destructive ability is the weight of destructive material which a weapon can deliver against an enemy in a given period of time.

With this thought in mind, a simple formula for computing firepower could then be:

$FP = W \times R$

where W = weight of projectile in pounds and

R = number of rounds per minute at the sustained rate of fire.

This formula is not foolproof and in some cases would appear to give disproportionate values, but, in the long run, the overall values derived appear as reasonable as those computed by more complicated methods. This formula, then, is offered merely as *a* method of computing and comparing firepower. Let us see how it works.

The basic arm of the infantry is the M1 Rifle. The weight of its bullet is .022 pounds. It can deliver these bullets at a sustained rate of 16 rounds per minute. In one minute of time, then, the M1 Rifle can deliver .352 pounds of destructive material. Similarly, to determine what destructive material another weapon can deliver we need only to consider the weight of its projectile and its sustained rate of fire.

For simplicity, let the firepower of the M1 be our common denominator. Give it a firepower of *one*, rather than the decimal figure, .352. Then, in computing the firepower of other weapons (weight of projectile times sustained rate) divide the resulting figure by .352. This does not alter the comparative firepower of weapons, but rather it provides us with a workable ratio. This ratio we call "firepower factor."

For example, let us determine the firepower factor for

the heavy machine gun, caliber .30. (See Chart III for the firepower factors of all infantry weapons.)

$$\frac{.022 \text{ (weight of bullet)} \times 125 \text{ (sustained rate)}}{.352} = 7.85 \text{ firepower factor of HMG}$$

With this formula as a basis, what is the firepower of the weapons employed collectively in our fighting units. Having determined the firepower factor of each weapon, we multiply that factor by the number of weapons organically assigned per unit to determine the firepower of the unit. The following table shows the firepower of the various infantry units beginning with the rifle company. (See Chart I.)

Note that the 81-mm mortar, with a higher rate of fire than the 4.2-inch mortar, has the greatest factor of any weapon organic to the infantry regiment.

The total firepower of the regiment is about five times that of the battalion and over 40 times that of one of its rifle companies.

The heavy mortar company of the infantry regiment provides a firepower equivalent to that of more than five rifle companies.

Chart II shows the comparative firepower strengths of the tank and artillery elements of the infantry division. Note the firepower of the tank battalion which is now organic to the infantry division.

Comparing this chart with Chart I, we see that the firepower of the division artillery is greater than that of an infantry regiment.

The tank company, infantry regiment, provides firepower almost equivalent to two light battalions of artillery.

Through the years, great advances have been made toward increasing the firepower of units without materially increasing their personnel strength. The advent of new weapons coupled with improvement of the old have been responsible for the increased firepower of our division today. (See Chart III.)

COMPARATIVE FIREPOWER TABLE (T/O&E 1948)

ITEM	Factor (1)	RIFLE COMPANY			BATTALION			REGIMENT			HEAVY MORTAR COMPANY		
		T/O &E	No. Used (2)	Fire-power	T/O &E	No. Used (2)	Fire-power	T/O &E	No. Used (2)	Fire-power	T/O &E	No. Used (2)	Fire-power
Carbine	2.26	37	37	83.9	253	253	571.78	1060	1060	2395.6	104	98	221.48
MG, cal .30, Hv	7.85				4	4	31.4	12	12	94.2			
MG, Cal .30, Lt	3.75	3	3	11.25	13	13	48.75	39	39	146.25			
(3) MG, cal .50	12.25	1	1	12.25	8	8	98	47	47	575.75	6	6	73.5
Submachine Gun	4.75							34	34	161.5			
(3) Launcher, Rkt, 2.36"	38.40	3	3	115.2	9	9	345.6	27	27	1036.8			
Launcher, Rkt, 3.5"	97.10				11	11	1068.1	56	56	5437.6	4	4	388.4
Mortar, 60-mm	155.00	3	3	465	9	9	1395	27	27	4185			
Mortar, 81-mm	780.00				4	4	3120	12	12	9360			
Mortar, 4.2"	349.00							12	12	4188	12	12	4188
Pistol, cal .45	0.85	33	9	7.65	130	26	22.1	530	84	71.4	24	0	0
(3) Rifle, cal .30, Auto	3.14	15	15	47.1	45	45	141.3	135	135	423.9			
Rifle, cal .30, M1	1.00	140	140	140	534	504	504	1980	1821	1821	62	54	54
Rifle, Recoilless, 57-mm	15.62	3	3	46.86	9	9	140.58	27	27	421.74			
Rifle, Recoilless, 75-mm	82.00				4	4	328	12	12	984			
(4) Tank, M26	300.00							22	22	6600			
(4) Vehicle, Utility, M44	16.00							1	1	16			
TOTAL FIREPOWER				929.21			7814.61			37,918.74			4925.38

(1) Factor = Weight of round (in pounds) × sustained rate of fire ÷ .352.

(2) Individual arms of gunners and assistant gunners of crew-served weapons, and of tank crews, have been deducted from T/O&E figures, since these weapons are not fired while their owners serve the crew weapons.

(3) Each MG, cal .50, is fired by one rifleman; each Launcher, Rocket, 3.5" is fired by two riflemen.

(4) Factors for tanks, carriages, and cars are the sums of the factors of all weapons mounted thereon.

Chart I.

COMPARATIVE FIREPOWER TABLE (T/O&E 1948)

ITEM	Factor	HV TK CO, INF REGT			HV TK BATTALION			F A BN, 105 HOW (Truck Drawn) (3)			INF DIV ARTY (3)		
		T/O &E	No. Used (1)	Fire-power	T/O &E	No. Used (1)	Fire-power	T/O &E	No. Used (1)	Fire-power	T/O &E	No. Used (1)	Fire-power
Carbine	2.26	51	28	63.28	278	173	390.98	545	0	0	2934	0	0
MG, cal .30 Hv	7.85				1	1	7.85						
MG, cal .30, Lt	3.75				11	11	41.25						
(2) MG, cal .50	12.25	1	1	12.25	13	13	159.25	23	23	281.75	106	106	1298.5
Submachine Gun	4.75	31	5	23.75	146	35	166.25	3	0	0	151	0	0
Howitzer, 105-mm	187.00							18	18	3366	54	54	10,098
Howitzer, 155-mm	270.00										18	18	4860
(2) Launcher, Rkt, 3.5"	97.10	2	2	194.2	18	18	1746.8	47	0	0	193	0	0
Mortar, 60-mm	155.00							1	0	0	3	0	0
Mortar, 81-mm	780.00				1	1	780.00						
Pistol, cal .45	.85	110	0	0	356	0	0	124	0	0	523	0	0
Rifle, cal .30, Auto	3.14				1	0	0						
(2) Rifle, cal .30, M1	1.00				19	0	0						
(4) Tank, M26	300 00	22	22	6600	69	69	20,700						
(4) Tank, M24	102.90				2	2	205.8						
Carriage, Multigun, cal .50	200.00										32	32	6400
(4) Vehicle, Armd, M44	16.00	1	1	16	6	6	96						
Carriage, Twingun, 40-mm	473.00										32	32	15,136
TOTAL FIREPOWER				6723.48			24.294.18			3647.75			37,792.50

(1) Individual arms of gunners and assistant gunners of crew-served weapons and of tank crews have been deducted from the T/O&E figure since these weapons are not fired while their owners serve their crew weapons.

(2) Each MG, cal .50, is fired by one rifleman; each Launcher, Rocket, 3.5" is fired by two riflemen.

(3) All individual arms and rocket launchers organic to the artillery have been deducted. The 60-mm mortars are used for FDC computations only.

(4) Factors for tanks, carriages, and cars are the sums of the factors of all weapons mounted thereon.

Chart II.

COMPARATIVE FIREPOWER OF VARIOUS U. S. DIVISIONS

ITEM	T/O&E 1921			T/O&E 1941		T/O&E 1945		T/O&E 1948	
	Factor	19,997 Men		15,245 Men		15,936 Men		18,899 Men	
		No.	Fire-power	No.	Fire-power	No.	Fire-power	No.	Fire-power
Carbine	2.26					5158	11,657.08	7474	16,891.24
Gun, 57-mm	41.2					57	2348.4		
MG, cal .30, Hv	7.85	26	204.1	122	957.7	90	706.5	40	314
MG, cal .30, Lt	3.75	45	168.75	57	213.75	121	543.75	160	600
MG, cal .50	12.25			113	1384.25	237	2903.25	350	4287.5
Submachine Gun	4.75			35	166.25	295	1401.25	638	3030.5
Cannon, 105-mm	187.00					18	3366		
Howitzer, 105-mm	187.00			36	6732	36	6732	54	10,098
Howitzer, 155-mm	270.00			12	3240	12	3240	18	4860
Launcher, Rkt, 2.36"	38.4					558	21,427.2	81	3110.4
Launcher, Rkt, 3.5"	97.1							465	45,151.5
Mortar, 60-mm	155.00			81	12,555	90	13,950	84	13,020
Mortar, 81-mm	780.00			36	28,080	54	42,520	40	31,200
Mortar, 3"	691.00	24	16,584						
Mortar, 4.2"	349.00							36	12,564

Pistol, cal .45	.85	9798	8328.3	7199	6119.15	1228	1043.8	2794	2374.9
Rifle, cal .30, Auto	3.14	792	2486.88	375	1177.5	405	1271.7	412	1293.68
Rifle, cal .30 M1	1.0			6942	6942	6349	6349	7156	7156
Rifle, cal .30, M1903	.62	8285	5136.7						
Rifle, 57-mm, Recoilless	15.62							81	1265.22
Rifle, 75-mm, Recoilless	82.00							39	3198
Gun, 37-mm, M1917	20	22	440						
Gun, 37-mm, M1938	31.9			60	1914				
(1) Tank, M26	300							123	36,900
(1) Tank, M24	102.9							9	926.1
(1) Tank, M45	207							12	2484
(1) Tank, M4A3	93.3							5	466.5
Gun, 75-mm	82.5	48	3960	8	660				
(1) Carriage, Multigun, cal .50	200							32	6400
(1) Carriage, Twingun, 40-mm	473							32	15,136
(1) Car, Armd, M8	35					13	455		
(1) Car, Armd, M20						1	13	1	13
(1) Car, Halftrack						5	81		
TOTAL FIREPOWER			37,308.73		70,141.60		119,918.93		222,740.54

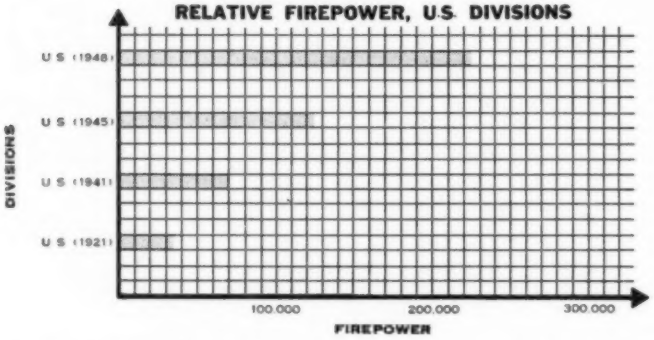
(1) Factors for tanks, carriages, and cars are the sums of the factors of all weapons mounted thereon.

Chart III.

In 1921 the "square" division possessed only eight types of weapons; in 1948 the division had 24 different weapons.

The aggregate strength of the 1948 infantry division is smaller than that of the 1921 division by 1,098 men, yet between 1921 and 1948, the firepower of the division has increased nearly six times.

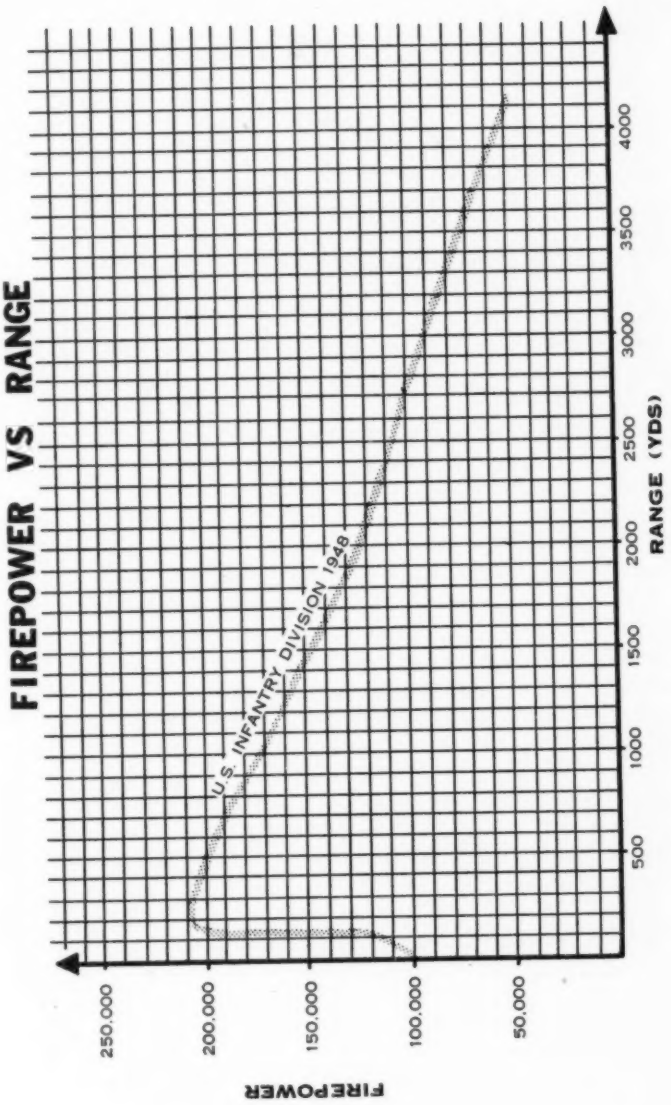
A graphic analysis forcibly indicates the increase in firepower from 1921 to 1948. (See Chart IV.)



Infantrymen are interested in the amount of firepower our present infantry division can deliver at the various ranges of combat. The weapons in the small arms series have comparatively short effective ranges, whereas the recoilless, mortar, tank, and artillery weapons have greater effective ranges. Therefore, by considering what weapons are effective at the various ranges, we can determine the firepower which the infantry soldier can expect at the critical combat ranges*. Chart V has been based on the table of maximum effective ranges for infantry weapons as published by The Infantry School.

The infantry division's firepower reaches its maximum between the ranges of 200 yards and 300 yards from the front line. Between these ranges all the division's weapons—small arms, mortars, tanks, and artillery—can be

*It is not intended to convey the impression that the total firepower of a unit, as shown on charts, would be developed in a tactical situation. Seldom, if ever, would any unit employ all its weapons at one time.


FIREPOWER VS RANGE
U.S. INFANTRY DIVISION 1948
FIREPOWER
250,000
200,000
150,000
100,000
50,000
500
1000
1500
2000
2500
3000
3500
4000
RANGE (YDS)

brought to bear. (Initial effective range of employment of mortars and artillery is considered to be approximately 200 yards from the line of battle.) At less than this range, the bulk of effective firepower comes from small arms.

As the range increases beyond 300 yards, weapons with short effective ranges become less effective, causing the firepower curve to descend, as the scale indicates. Beyond 4,000 yards, only the tank and artillery weapons can be considered effective.

Note that, with our present weapons, the firepower of our fighting units reaches its maximum between 100 and 300 yards. It is between these ranges that we can inflict the greatest number of casualties upon an enemy who chooses to overrun our position by sheer weight of numbers.

The basis of computation used in this article permits us to compare the firepower of any of our units with comparable units in foreign armies.

We must not conclude from this study that every American unit is superior to every foreign one. The firepower computed for each unit—each weapon—is its potential. To achieve the full effect of each weapon—each unit—we must look to the training of every soldier in the use of his weapon—whether it be individual or crew-served.

If our soldiers know only how to discharge these weapons, they are woefully unprepared for combat. Each soldier must know his weapon's limitations and capabilities—must know when and where and how to use it.

If all our soldiers are masters of their weapons, those weapons will give mastery over our adversaries in battle—the ultimate test of firepower.

Letter To Editor

In the October Quarterly, Lieutenant Colonel Palmer states that the "tank may be forced to lighten its armor and rely on maneuverability, firepower, and speed to carry out its mission." Has it not reached this stage of development already?

The development of anti-armor weapons which have forced this change in tank design also place in a very poor light the proposed armored personnel carrier for general use by the infantry. The real need is for a full-tracked cargo carrier (¾-ton truck capacity) for the rapid transporting of heavy weapons and supplies over difficult terrain.

Indications being that "the infantry will decide the issue in the next war as it did in the last," it seems quite evident that we must develop superior infantry weapons and tactics to counteract the "great wall of flesh" with which our present contemplated enemy will confront us. Being constantly confronted with superior numbers will force us to become "casualty conscious." Night operations will become common because of the light casualties sustained in this type of action. The new light body armor and helmet now being experimented with will become issue. Towns and cities will be by-passed because of the high casualties involved in taking them. Such objectives will be burned and starved into submission. Since a city's source of water supply is not usually within the city, its water can therefore be contaminated, thus preventing its use as drinking water. The said contaminant could be of a type that would "gum-up" or destroy fire-fighting equipment. Planning, timing, and close coordination of all arms will be of utmost importance. "This entails constant and thorough combined arms training at all levels, with the emphasis on teamwork."

If we are agreed that combined arms training is essential, then the next question is how is it to be accomplished. Since the Command and Staff School and the War College take care of this problem on the higher levels, we are left with the problem of training company grade officers and sergeants. My answer is The Combined Arms School wherein each arm supplies instructors and the latest information as to its respective arm. Incidentally combined arms training is the real answer to the problem set forth in Major Edmond's article, IS DIRECT SUPPORT NECESSARY?

If some member of the staff of The Infantry School were to answer this letter, making comments as to the above, it would be very much appreciated.

JAMES W. CLARK
Lieutenant, Artillery

Thank you for your letter. Your ideas about the development of infantry weapons and tactics are interesting.

Present trends in tank design are towards heavier armament and greater armor basis, with the resulting weight requiring in turn more horsepower and greater flotation in order to achieve some degree of mobility and speed. Most observers agree that tanks are approaching the optimum in gun-power and armor basis without becoming immobilized because of their weight and bulk. The development of lighter metals with perhaps increased ballistic properties may allow greater armor basis and firepower with no increase in weight. But to answer your question specifically, it's "No, at least not yet."

Here is the current thought on your question regarding the vulnerability of the armored personnel carrier to antitank weapons: The armor of the personnel carriers is for protection against shell fragments and small arms fire rather than against antitank weapons. All modern armies have weapons capable of penetrating existing and developmental models of United States armored personnel carriers. In situations where armored infantry attacks mounted, one of the missions of the accompanying tanks is to protect the armored personnel carriers of the armored

infantry. Thorough reconnaissance and an accurate estimate of the situation reduce the possibility of placing armored infantry units in situations where enemy antitank weapons can be brought to bear on armored personnel carriers.

On the subject of a Combined Arms School: The Infantry School holds that combined arms teamwork and training begins at the smallest unit level, for example, a rifle squad working with a tank. For this reason, combined arms teamwork is stressed at The School at all levels of instruction from the NCO classes to the officer advanced classes. The School has instructors from the artillery, armor, chemical corps, engineer corps, and tactical air force who are up to date on the latest tactics and techniques of their arms. As far as possible, instruction is conducted on an integrated basis so that students get a complete picture of the combined arms teamwork that exploits our maximum capabilities. In this respect, The Infantry School is a combined arms school on the lower echelons, perhaps more so than the other branch service schools which necessarily must devote more time to the techniques of their particular arms.

Quarterly Writers

Captain Robert M. Cook, of The Infantry School's Automotives Department, gives you a look at the Army's new workhorse in YOUR NEW 2½-TON TRUCK. A 1943 graduate of the Military Academy, Captain Cook recently received his M. A. degree in Automotive Engineering from the University of Michigan. He got his "know-how" of combat motor transportation in Europe with the 4th Armored Division during the fall and winter campaigns of 1944-45. During the early occupation of Germany he was directly concerned with motor transportation during the severe winter months of 1945-46.

* * * * * *

In RAIDING PATROL, Captain Charles K. Blum makes his second appearance in the QUARTERLY. This article shows the planning preceding and the execution of a patrol into enemy territory. Captain Blum knows whereof he speaks. His writing is backed with practical experience picked up with the 3d Infantry Division in Europe plus a couple of years as an instructor at The Infantry School where he is now assigned to the Tactical Department.

Major Schiller F. Shore, whose BAYONET: SPIRIT WEAPON appeared in our last issue, has written DISCOVER YOUR FIELD GLASSES in this issue. Major Shore contends, and with reason, that too many people know too little about this valuable aid to vision.

* * * * * *

Captain V. L. Antonioli, author of FIREPOWER TODAY, is a graduate of the Military Academy, class of January 1943. He served during the war with the 76th Division in Europe, followed that with a tour in the G3 Section, V Corps, was aide to the commanding general 1st Division, and for the past year and a half has been a Weapons Instructor at The Infantry School.

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Just at present Lt Col James W. Edwards is inaccessible to QUARTERLY biography-hunters. The colonel, who commanded the battalion of the 23d Infantry, 2d Division in ACTION AT TONGMYONGWON, mailed his article to us from Korea. As far as we've been able to ascertain, he's still with his battalion—still in Korea—as the QUARTERLY goes to press.

A newcomer to the QUARTERLY, Captain J. K. Cockrell presents a new approach to the problem of BALANCING CARGO AIRCRAFT. Captain Cockrell, Military Academy 1942, served with the 82d Airborne Division in Europe and since the war has had various assignments which included work with the G2 Division, General Staff; G2 Section, Antilles Department; and Assistant G3 with the 82d Airborne Division. He is now an Advanced Class student at The Infantry School.

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First Lieutenant Albert R. Ives puts the reader in the role of a forward observer in FORWARD OBSERVATION: SIMPLIFIED. He carries the observer step by step through a fire mission using the *target-grid* method of fire control. Lieutenant Ives, a 1946 graduate of the Military Academy, later served two years with the 7th Division in Korea. Since 1948 he has been a Weapons Instructor at The Infantry School. He is a brother of Captain Robert N. Ives, whose GUNS AGAINST ARMOR appeared in the July QUARTERLY.

* * * * * *

The QUARTERLY presents the ideas of an artilleryman, Major Edward M. Flanagan, in DEATH OF THE GLIDER. Exponent of the heavy drop technique of aerial supply, Major Flanagan is a January 1943 graduate of USMA. During the war he commanded a battery of the 457th Parachute Field Artillery Battalion, and later, was G3 Air of the 11th Airborne Division.

Since the war he has written THE ANGELS, A HISTORY OF THE 11TH AIRBORNE DIVISION; has graduated from the 1945-46 short course at Leavenworth, and the regular Air Command and Staff School Course at The Air University. He has also served on the staff of the 82d Airborne Division, and is now teaching airborne techniques at The Artillery School.

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Captain Frank F. Rathbun is no newcomer to the QUARTERLY. His NEW LOOK AT TRAINING FILMS appeared in the April 1950 issue. In his current article, NEW INFANTRY TRAINING FILMS, he reviews the latest training films applicable to infantry training. Captain Rathbun served with the 6th Division in the Pacific from 1943 to 1945. Following the war, he served a tour of duty in Japan, and for the last two years he has worked on training films at The Infantry School.

* * * * * *

Lieutenant Chester R. Mead, whose article on the use of the SCR-300 as an aircraft radio reached us before the outbreak of the Korean conflict, was a member of the 24th Division at the time he wrote the article. Since that time we have had no direct news of this young author. However, reports from Korea indicate that the SCR-300, used in the manner he advocates, has been successful as a means of maintaining air-ground liaison.

Major LeRoy C. Brown author of TELL 'EM HOW, SHOW 'EM HOW recently completed a tour of duty as an instructor in the Tactical Department of The Infantry School. He is now assigned as an instructor in night operations at the Ranger Training Center, Fort Benning. During the war, Major Brown served four years with the 158th RCT, the famous Bushmaster outfit, in the Pacific.

* * * * * *

Lieutenant Colonel George B. Pickett, Jr., one of the Army's most prolific writers, has written this issue's CAPTAIN DOUGHBOY — INFANTRY-TANK TEAM COMMANDER. Of many previous articles, his most recent one was THE FUTURE OF CLOSE COMBAT which appeared in July 1950. Colonel Pickett, whose articles usually deal with armor, served with the 11th Armored Division in the European campaigns of World War II. Post-war assignments include a tour at The Infantry School as an instructor in armor tactics. He is now serving in Korea.

* * * * * *

Captain Robert J. Parr, an instructor in The Infantry School's Weapons Department, presents the characteristics and capabilities of his specialty, the 3.5-inch rocket launcher in THE BIG BAZOOKA. A graduate of the Military Academy, 1945, Captain Parr served with the 9th Division in Germany, following the war; and followed that with an assignment as aide to the Commanding General US Constabulary before coming to Fort Benning. A few months ago, Captain Parr headed the instruction team that introduced the big bazooka to front-line troops in Korea.

Coming, in the April issue — MENTAL SOP, by Colonel A. S. Newman. How to organize your thought processes for orderly efficient solution of military problems.

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